TRAFFIC OPERATIONS

GUIDANCE MANUAL

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET

JUNE 2005

Division of Traffic Operations **Transportation Cabinet**

Produced by the Organizational Management Branch
Office of Human Resource Management

TRANSPORTATION CABINET
Frankfort, Kentucky 40622
www.kentucky.gov

Ernie Fletcher
Governor

Bill Nighbert
Acting Secretary

Jim Adams
Deputy Secretary

Marc Williams
Commissioner of Highways

Paul Steely
Commissioner of Aviation

Roy Mundy
Commissioner of
Vehicle Regulation

OFFICE OF THE SECRETARY

OFFICIAL ORDER 103129

SUBJECT: *TRAFFIC OPERATIONS GUIDANCE MANUAL*

This manual has been prepared to provide information and guidance to personnel of the Transportation Cabinet. Its purpose is to give uniformity in the interpretation and administration of laws, rules, and regulations applicable to the operation of the *Division of Traffic Operations* and its relationship with other units of the Cabinet.

The rules and regulations contained within are approved and declared effective unless officially changed.

All previous instructions, written and oral, relative to or in conflict with this manual are hereby superseded.

Signed and approved this 10th day of August, 2005.

Bill Nighbert
Acting Secretary

Approved as to Form and Legality:

Office of Legal Services

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TRAFFIC OPERATIONS

Chapter

INTRODUCTION

Subject

Design of This Guidance Manual

ORGANIZATION & NUMBERING:

Chapter Title—The subject matter in the manual is divided into chapters. The chapter title appears in the upper right-hand corner of the first page of a subject and in the upper left-hand corner of any subsequent page.

Subject Title—The title of a subject appears in the upper right-hand corner of the first page of a subject and in the upper left-hand corner of any subsequent page.

"TO" Prefix—Preceding each subject number, this prefix stands for the manual title *Traffic Operations.*

Date—The latest issuance date of a subject appears at the bottom of each page of the subject. This date agrees with the latest issuance date shown for the subject in the Table of Contents **(TO-01).**

Page Numbering—Each subject has its own page numbering, which appears at the bottom of each page.

LOCATING INFORMATION:

Two indexes appear at the front of the manual, and one index appears at the back:

- **Table of Contents (TO-01)**—This index at the front lists the titles of the manual's chapters and their subjects, as well as other information, in numerical order. It includes the latest issuance dates of all the subjects. As the manual matures, these dates change.

- **Alphabetical Index (TO-02)**—This index at the front alphabetically lists key information in the manual. Generally, it directs the user to subject titles and to margin, paragraph, and subparagraph headings within subjects.

- **Table of Exhibits (TO-9900)**—This index at the back lists the manual's exhibits, including forms, worksheets, diagrams, etc., by number and title.

CONT.

CROSS-REFERENCES IN MANUAL:

Subject Numbers within Narrative—A subject number within the narrative on a page directs the user to more information about the subject.

QUESTIONS:

Whom to Contact—For answers to questions about the contents of the manual, please contact:

Division of Traffic Operations
Transportation Cabinet Office Building
W3-26-02
Frankfort, KY 40622
(502) 564-3020

For copies of the manual, please contact:

Policy Support Branch
Transportation Cabinet Office Building
W4-26-02
200 Mero Street
Frankfort, KY 40622
(**502) 564-3670**

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TRAFFIC OPERATIONS

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ADMINISTRATION

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Organization

DIVISION OF TRAFFIC OPERATIONS:

The Division of Traffic Operations is a work unit within the Office of System Preservation and Operations within the Transportation Cabinet. The mission of the division is to improve the safety and operation of the highway system by managing highway safety and traffic-operational programs and projects, developing and updating policies, providing technical expertise, and supporting the Transportation Operations Center. The division is responsible for the formulation, distribution, and interpretation of the policies, rules, and regulations that relate to the traffic functions of the Transportation Cabinet.

The division is divided into the following three engineering branches:

- System Operations Branch (which includes an electronics repair shop)
- Traffic Design Services Branch
- Traffic Engineering Branch (which includes the Traffic Data Safety Service)

An administrative staff reports directly to the director and is responsible for providing the necessary administrative support to the division.

DISTRICT:

Traffic functions of the district are conducted based on the organizational structure of each individual district.

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TRAFFIC OPERATIONS

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Responsibilities

SYSTEM OPERATIONS BRANCH:

The System Operations Branch investigates, deploys, operates, and maintains the technology applications on the state-maintained highway system. The goals of the branch are to manage congestion, improve safety, and disseminate information to the traveling public. Specific duties include but are not limited to:

- Procuring, installing, operating, and maintaining:
  - Traffic signal systems
  - Dynamic message signs
  - Traveler information kiosks
  - Roadway weather information systems
  - Closed circuit television cameras
  - Automatic vehicle identification systems
- Operating and maintaining the traffic signals in Franklin County
- Supporting the Transportation Operations Center
- Maintaining the statewide Intelligent Transportation System (ITS) Strategic Plan, Business Plan, and Architecture
- Assisting with regional ITS plan and architecture development
- Merging technology-based applications into traditional highway projects
- Implementing, operating, and maintaining the 511 telephone information program
- Implementing, operating, and maintaining the statewide traffic signal monitoring software
- Managing ITS deployments
- Providing technical advice and training to the districts and central office

CONT.

TRAFFIC DESIGN SERVICES BRANCH:

The Traffic Design Services Branch is primarily responsible for designing traffic signal and roadway lighting projects for letting to contract. Other duties of the branch include:

- Ø Performing final inspections on completed projects
- Ø Providing technical advice and training to the districts and central office
- Ø Performing research on new software and hardware products used for traffic control electrical devices and lighting
- Ø Reviewing plans and permits prepared by others
- Ø Writing specifications for products used in traffic signal and roadway lighting design

TRAFFIC ENGINEERING BRANCH:

The Traffic Engineering Branch is responsible for the following duties in the areas of traffic engineering and highway safety:

- Ø Providing traffic engineering expertise to the districts and others
- Ø Conducting traffic engineering investigations, analyzing data, developing alternatives, and proposing solutions to technical traffic problems
- Ø Reviewing plans and providing input on preconstruction activities
- Ø Serving as team leaders/members on highway safety teams, design and construction activities, technical committees, and other work groups
- Ø Drafting, reviewing, and interpreting policies, manuals, methods, and specifications relating to traffic engineering programs and activities
- Ø Managing the Raised Pavement Marker system and preparing contract documents for raised pavement marker projects
- Ø Providing technical expertise on bicycle and pedestrian traffic issues
- Ø Providing technical expertise on temporary traffic control and maintaining the temporary traffic control standard drawings
- Ø Coordinating and administering the Hazard Elimination Safety (HES) Program
- Ø Coordinating highway safety activities among various state and local agencies, other divisions, and FHWA
- Performing crash surveillance activities and compiling high-crash location listings

CONT.

TRAFFIC ENGINEERING BRANCH (cont.):

- Ø Providing crash data and analysis to various users
- Ø Conducting training
- Ø Conducting and coordinating traffic engineering and highway safety research

DISTRICT: Each district carries out the various traffic functions within its jurisdictional boundaries based on the organizational structure of each individual district.

Each district is generally responsible for the following activities:

- Ø Preparing and administering a budget for all traffic activities including materials, labor, and equipment
- Ø Managing and directing the work of the district traffic crews and contractors
- Ø Procuring and maintaining an inventory of traffic materials
- Ø Reviewing, recommending, installing, inventorying, and maintaining the traffic control devices and roadway lighting in its district
- Ø Acting as the initial contact for requests and complaints from the public and government officials
- Ø Carrying out the policies and procedures of the Cabinet
- Ø Conducting engineering studies and gathering data needed for engineering decisions
- Ø Participating in Project Development Teams and reviewing engineering plans
- Ø Providing traffic engineering advice and consultation to other functions within the district
- Ø Performing the duties specified in the *Permits Manual* (if applicable)
- Ø Reviewing crash data, conducting reviews and investigations at identified high-crash locations, and participating in various highway-safety-related activities
- Ø Providing traffic engineering services and work for local governments and other agencies through interagency agreements
- Ø Handling open-records requests and providing testimony in response to subpoenas in Board of Claims cases, civil cases, and criminal cases involving traffic control devices in its district

TRAFFIC OPERATIONS

Chapter

ADMINISTRATION

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Approval Authority

SECRETARY OF TRANSPORTATION: Approval for the installation of the following traffic restrictions and regulations on state highways shall be granted by the Secretary of Transportation through an Official Order after review and recommendation by the district and division:

- Speed limits (except those covered by statute or administrative regulation)
- Lane-use restrictions
- Naming of roadways and bridges (other than those approved by the legislative acts of the General Assembly)

STATE HIGHWAY ENGINEER: Regarding pavement markings, the installation of six-inch lines on roadways other than interstates and parkways shall require the approval of the State Highway Engineer.

DEPUTY STATE HIGHWAY ENGINEER FOR PROJECT DELIVERY & PRESERVATION: Approval for the installation of the following traffic control devices on state highways shall be granted by the Deputy State Highway Engineer for Project Delivery and Preservation after review and recommendation by the district and division:

- Traffic signals
- Flashing beacons
- School flasher assemblies
- Interchange lighting involving six-year plan funding designated for safety or lighting
- Reversible lane signals

CONT.

DIRECTOR OF TRAFFIC OPERATIONS:

Approval of the following traffic control devices/phasing on state highways shall be granted by the Director of Traffic Operations after review and recommendation by the district and division:

- Intersection lighting
- In-roadway lights
- Permanent transverse rumble strips
- Centerline rumble strips
- Interchange guide signs
- Interchange lighting on roadway projects
- Traffic signal phasing changes
- Audible and exclusive pedestrian phases

DISTRICT:

Unless otherwise addressed in this manual, the installation and modification of all other traffic-control devices shall be made by the district based on the principles outlined in the *Manual on Uniform Traffic Control Devices (MUTCD).* The division is available for advice and consultation on all traffic-engineering decisions made by the district.

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Standards

STANDARDS: The *Manual on Uniform Traffic Control Devices (MUTCD)* is a national standard relating to all traffic control devices installed on public highways and streets. KRS 189.337(2) and 603 KAR 5:050 require that traffic control devices installed on all public highways or streets be in substantial conformance with the *MUTCD.* As such, the *MUTCD* will serve as the basis for the *Traffic Operations Guidance Manual (TOGM)*. All substantial deviations from the requirements of the *MUTCD* shall be noted in the *TOGM* and its future revisions or be approved in writing by the State Highway Engineer, Commissioner of Highways, or Secretary of Transportation.

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TRAFFIC OPERATIONS

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ADMINISTRATION

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Purchasing

PURCHASING: The division shall establish and monitor master agreements for materials and services used by the districts and division. The division shall also maintain a stock of various other materials that cannot be feasibly purchased on a master agreement (i.e. poles, cabinets, and controllers). The district shall be responsible for stocking district facilities either by ordering directly from master agreements or from the transportation warehouse. When an item is not available from either of these sources, the district shall prepare the necessary purchasing documents and follow the guidelines set forth by the Division of Purchases. Proper procurement procedures are available in the *Division of Purchases Guidance Manual*. Proper inventory guidelines are available in the *Operations Management System (OMS) Policies and Procedures Manual*.

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TRAFFIC OPERATIONS

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ADMINISTRATION

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Local Participation

REGULATIONS: Traffic regulations required for the safe and expeditious movement of traffic are established in several different ways, including by statute, by Official Order, or by a local agency (city, county, or joint city/county agency). References are made throughout this manual to specific regulations where such a reference is essential to the proper performance of the traffic function.

The Cabinet prescribes by Official Order such regulations as may be required for state-maintained roads and streets. In cities of second to sixth classes, most but not all regulations are prescribed by ordinances of the cities. However, Kentucky Revised Statute 189.233 provides the procedure by which the Cabinet may act in such cases where the cities will not. In practice, it is seldom necessary to exercise this authority. To this end, the standard Maintenance and Traffic Contract between local agencies and the Cabinet provides as follows:

- Ø The local agency agrees to pass no ordinance relating to state-maintained streets, viaducts, and bridges without first having submitted to the Cabinet a copy of the ordinance at least five days prior to the time of the vote on the ordinance.

- Ø The local agency agrees to pass any necessary parking or other ordinances to ensure the maximum use of said highways for vehicle travel consistent with safety, as determined by the Cabinet.

LOCAL INPUT: Historically, there has been excellent cooperation with local agencies on matters pertaining to traffic regulations. This cooperative effort is enhanced by an approach based upon mutual trust and honesty. Regulations should not be instituted or implemented without first having given the local agency an opportunity to review and comment upon the proposals, because the effectiveness of regulations will depend on the degree of local acceptance and enforcement. In addition, local agencies are sometimes required to pay the utility costs for electrical devices.

CONT.

LOCAL INPUT (cont.):

The district shall solicit input from the appropriate local agency on the Cabinet's findings regarding the following:

- Ø Installation or removal of traffic signals
- Ø Speed limits
- Ø School speed limits
- Ø Flashing beacons (if local agency is required to pay utility cost)
- Ø Stop control changes

If the local agency does not concur, the district should provide the division with a complete report to enable the division to determine the validity of the objections to the proposals.

Where agreement cannot be reached between a local agency and the Cabinet, the division will submit a recommendation to the appropriate level of approval. If the proposal is approved, the local agency will be notified by a letter from the district indicating that the Cabinet acknowledges the objections of local officials but has no other recourse than to make the recommended changes.

LOCAL AGENCY MAINTENANCE & TRAFFIC AGREEMENTS:

The Secretary of Transportation may, by Official Order, assume the responsibility for regulating traffic and parking on streets accepted as a part of the state-maintained system and may contract with the local agency for the performance of this function. In the control of traffic at intersections on state-maintained highways, it is often necessary to place traffic control devices outside the state right-of-way. In all cases, these devices must be limited to those actually required to provide for the safety and convenience of the motorists using the state-maintained facility. No such devices are to be installed outside the right-of-way, unless specific authorization has been given in the form of either a Maintenance and Traffic Contract (TC 71-11 form, **Exhibit 1)** or a completed Consent and Release form (TC 71-14 form, **Exhibit 2).**

The district is responsible for negotiating a Maintenance and Traffic Contract with any local agency in the district. A new contract is to be negotiated when directed by the State Highway Engineer's office.

When it is determined that a new Maintenance and Traffic Contract is needed, the district shall have the contract prepared and submitted to the local agency for approval. After local agency approval, the original and four (4) copies shall be forwarded to the State Highway Engineer's office for approval. The State Highway Engineer's office will withhold approval, pending approval of the official order of acceptance.

CONT.

LOCAL AGENCY MAINTENANCE & TRAFFIC AGREEMENTS:

After approval by the State Highway Engineer's office, the original and two copies shall be returned to the district, one copy shall be sent to the Division of Maintenance, and one copy shall be sent to the Division of Traffic Operations.

The district shall forward one copy to the proper local agency and retain the original and one copy for its files.

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TRAFFIC OPERATIONS

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HIGHWAY SAFETY PROGRAM

Subject

Safety Management Process

OVERVIEW*:* Outlined is the Integrated Safety Management Process as developed in cooperation with AASHTO's Strategic Highway Safety Plan through *NCHRP Report 501*. This is a data-driven process to reduce fatalities, injuries, and economic loss on Kentucky highways. The Integrated Safety Management Process defines a system, organization, and process for managing the attributes of the road, driver, and vehicle to achieve the highest level of safety by integrating the work of disciplines and agencies involved in highway safety.

LEADERSHIP: The agencies responsible for highway safety need capable leadership in order to be able to adapt quickly to new situations, unite all levels of management, and promote realistic visions. The Governor's Executive Committee on Highway Safety (GECHS) represents the top management of the Safety Management System (SMS) and is responsible for defining the overall highway safety goals, providing resources and other support, and ensuring learning and improvement. In addition, the GECHS should lead in activities for the development of its own safety emphasis areas and strategic safety improvement plan, similar to the major safety emphasis areas identified in AASHTO's Strategic Highway Safety Plan. GECHS responsibilities are:

- Ø Lead the establishment of the SMS as outlined in *NCHRP Report 501*
- Ø Set the overall highway safety goals
- Ø Lead in the preparation and justification for the budget to sustain the SMS
- Ø Select the appropriate emphasis areas
- Ø Commit to and follow up on providing resources as outlined in a Memorandum of Understanding between agencies
- Ø Integrate the resources and activities of those agencies
- Ø Ensure that the SMS works efficiently and maximizes highway safety

CONT.

OPERATIONS: The Operations Manager (OM) is the safety champion responsible for directing daily activities, coordinating efforts of various teams, acting as the focal point for the SMS, and providing the GECHS with support in planning and implementing highway safety system improvements. The Cabinet's Highway Safety Coordinator currently serves as the Operations Manager.

OM responsibilities are:

- Ø Serve as staff to the GECHS
- Ø Provide day-to-day management of the SMS
- Ø Provide the GECHS with information in a manner easily understood to allow interaction with the GECHS members and staff for the determination of priority emphasis areas
- Ø Ensure that the GECHS vision and mission are clearly understood throughout the SMS organization
- Ø Develop and administer the safety budget under the direction of the GECHS
- Ø Integrate and prepare the Strategic Highway Safety Plan

DATA ANALYSIS: The Division's Traffic Safety Data Service (TSDS) conducts the quantitative analysis and evaluation and assembles safety information as requested by the OM, GECHS, or task teams. This group is critical to the success of the SMS because it provides the safety profile from which the GECHS determines the emphasis areas of concern to be pursued and evaluates the implementation of the process.

TSDS responsibilities are:

- Ø Provide highway safety information that is accurate, consistent, timely, and complete for the development of a statewide Strategic Highway Safety Plan
- Ø Provide highway safety information for the GECHS and OM to identify major safety concerns, as needed for determining vision, goals, budget, and emphasis areas
- Ø Bring to the attention of the OM and/or the GECHS deficiencies and obstacles that may exist in the state's information system

CONT.

TASK TEAMS: Task teams comprise personnel from various agencies who are called on to address a specific safety problem or emphasis area under the direction of the GECHS and the OM. The selection of task team members depends upon the emphasis area. It is important to engage all the disciplines and role players that are encompassed within the scope of the selected emphasis area. The key discipline representative of a specific safety emphasis area should be in the lead role, referred to as the task team leader. It is recommended that a task team assigned to one of the emphasis areas of the AASHTO Strategic Highway Safety Plan use the corresponding AASHTO implementation guides (*NCHRP Report 500*) as a primary source of information.

Task team responsibilities are to:

- Ø Provide feedback on the appropriateness of emphasis area objectives, which are set by the GECHS and the OM
- Ø Develop strategies and action plans for the selected emphasis areas to achieve the SMS's mission
- Ø Develop details of action plans (resources, interdependencies, responsibilities, and time schedules) for implementation
- Ø Coordinate with the task team's own particular agencies for:
  - ♦ Allocation of resources for the implementation of relevant actions in the action plans
  - ♦ Integration of other local plans with those of the Strategic Highway Safety Plan
- Ø Facilitate the implementation of the strategies' action plan

PROCESS STEPS: The six major steps of the SMS process are as follows:

1. Review highway safety information.
2. Establish emphasis areas and goals.
3. Develop objectives, strategies, and preliminary action plans to address the emphasis areas.
4. Determine the appropriate combination of strategies for the identified emphasis areas.
5. Develop detailed action plans.
6. Implement the Strategic Highway Safety Plan and evaluate performance.

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TRAFFIC OPERATIONS

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HIGHWAY SAFETY PROGRAM

Subject

Safety Candidate Locations

IDENTIFICATION: Either the division or district may identify safety-candidate locations.

The Traffic Safety Data Service (TSDS) will create various listings of possible safety-candidate locations each year after the CRASH database is finalized for the calendar year and annual collision rates are determined by the Kentucky Transportation Center. These listings will include, but are not limited to:

- Ø 0.3-mile locations (total collisions)
- Ø 1.0-mile locations (total collisions)
- Ø 0.3-mile locations (fatal collisions only)
- Ø 1.0-mile locations (fatal collisions only)
- Ø 0.3-mile locations (fatal and injury collisions only)
- Ø 1.0-mile locations (fatal and injury collisions only)

Locations may also be identified through historical observations or requests from co-workers, local officials, and citizens.

Typically, the most recent three-year period for which crash information is available will be used, although other time frames may be used if appropriate. All locations that have been determined to have a critical rate factor (CRF) equal to or greater than 1.0 are considered to be potential safety-candidate locations. Due to limited resources, not all intersections with a CRF greater than 1.0 will be evaluated and/or corrective measures implemented.

DATA REVIEW: Selected safety-candidate locations will be further evaluated by review of the collision history. This history may be obtained from the CRASH program, local law enforcement records, or any other available method. Collision diagrams should be prepared using legitimate crash reports for the location. The collision diagrams will show the type, date, time, weather conditions, and severity of each crash. The compilation of crash reports and preparation of collision diagrams are primarily the responsibility of the TSDS, but the district may assist with or perform these duties.

CONT.

INVESTIGATION: Investigation of a safety-candidate location will consist of reviews of crash reports and collision diagrams, and on-site inspection of the location. This investigation may be conducted by one of the following:

Ø **Multidisciplinary Investigation Team**—The team should be composed of at least:

- ♦ The District Traffic Branch Manager and/or District Traffic Engineer
- ♦ A District Traffic Branch Manager or District Traffic Engineer from another district
- ♦ An engineer from the Traffic Engineering Branch
- ♦ A District Maintenance Engineer
- ♦ A police officer who normally investigates crashes at the location

Ø **Squad Investigation Team**—The team should be composed of engineers from the Traffic Engineering Branch and the District Traffic function.

RECOMMEN-DATIONS: After investigating the location, the investigation team will recommend corrective improvements and the method of accomplishing these corrective improvements. The method of accomplishing the corrective measures will be determined by the scope of work to be done. Corrective improvements may be accomplished by, but are not limited to, the following:

Ø Law enforcement agencies (increasing enforcement of traffic laws)
Ø District traffic crews
Ø District maintenance crews
Ø Hazard Elimination Safety Program
Ø Construction or reconstruction projects

An investigation report detailing the recommendations will be submitted by the district to the division. Notification of completion of corrective improvements, including date and total cost, will follow the same submittal process.

EVALUATION: After completion of the corrective improvements, the location will be periodically monitored to determine the effectiveness of those improvements. The TSDS will keep these locations in a database and perform before-and-after studies on a yearly basis. This analysis will provide useful data as to the effectiveness of various improvements and help the Cabinet determine which improvements should be used at other locations in the future. This monitoring will be conducted by the TSDS but may also be done by the district.

TRAFFIC OPERATIONS

Chapter

HIGHWAY SAFETY PROGRAM

Subject

Hazard Elimination Safety Program

OVERVIEW: The Hazard Elimination Safety (HES) Program provides funding for improving locations or sections of highways that have significant collision histories. The HES process identifies problem areas and determines corrective actions that might provide a greater degree of safety for the traveling public. Usually, lower-cost improvements have already been implemented but have not proven adequate at these locations.

LOCATIONS: Identification of candidate locations is the responsibility of the district. District HES coordinators solicit potential locations from various sources. They include:

- Ø High-crash listings from the division's Traffic Safety Data Service
- Ø Various computer software programs
- Ø Citizen requests
- Ø Requests from other state and local agencies

ANALYSIS: Candidate locations shall be analyzed by the district using the following process:

1. Select locations for detailed analysis from list of candidate locations.

2. Obtain and analyze crash reports for locations selected for detailed review.

3. Visit site to determine characteristics of locations relative to types of crashes occurring.

4. Recommend improvements or corrective measures to address patterns in crashes. Project length limits are established using the collision reports and required length for the corrective actions. A project scope is developed incorporating the improvements or corrective measures with associated costs estimated for design, right of way, utilities, and construction.

CONT.

SUBMITTAL: Candidate locations the district considers to be worthy to advance are submitted to the Central Office HES coordinator by the district HES coordinator. The submittal shall include a completed HES Project Submittal Form **(Exhibit 3)** and an HES Project Scope/Corrective Measures Worksheet **(Exhibit 4).** Electronic versions of these forms (in Excel format) are available upon request.

In addition to the information on these forms, the following information shall be submitted:

- Ø CRASH reports for the location for three previous years
- Ø CRASH diagrams of the location

REVIEW: The division shall review submitted locations to determine whether they meet the basic requirements of the program. The basic requirements include the following:

- Ø Minimum number of collisions over a three-year period (5 for rural and 14 for urban locations)
- Ø Critical rate factor of 1.0 or greater
- Ø Total project cost not to exceed $1,500,000
- Ø Benefit/cost ratio greater than 1.0
- Ø Proposed project addresses crash pattern at location

APPROVAL: The Central Office HES coordinator will submit qualifying projects meeting the program's basic minimum requirements to FHWA for approval. If approved by FHWA, the projects are prioritized, matched with the available funding, and added to the Six-Year Highway Plan or assigned to the appropriate function to be completed by state forces.

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TRAFFIC OPERATIONS

Chapter

SIGNS

Subject

General

OVERVIEW: Set forth are the requirements for signing on the state roadway system. Except as noted elsewhere in this chapter, all signs shall be fabricated, installed, and maintained according to the *Manual on Uniform Traffic Control Devices (MUTCD)*, current adopted edition, and the *Standard Highway Signs* manual. The purpose of this chapter is to discuss any additions to or departures from the *MUTCD*.

PRIORITY LEVEL: Because regulatory and warning information is more critical to the road user than guidance information, regulatory and warning sign placement shall receive priority where space is limited and/or conflicts occur. In such cases, guide signs should be moved or omitted.

SIGN LAYOUTS: Layouts for signs mentioned in this manual, but not in the *MUTCD*, may be obtained from the Central Sign Shop or the *Standard Highway Signs* manual.

SIGN SUPPLIES: Most signs and substrates for use by district forces will be stocked in the Central Sign Shop for distribution to the districts. Other sign supplies are also available from this source. Sign posts are an exception, however, with delivery being made directly to district stockpiles through a statewide contract set up by the Central Office.

SIGN MESSAGE PRINTING: Signs are produced using a silk-screening process or electracut film, or by placing precut letters, numbers, etc., onto sign sheeting blanks. Silk-screen-process printing of sign messages and symbols has been proven the most effective means of producing signs of lasting quality and will be used to mass-produce standard signs of common usage. Electracut film or precut letters will be used to make special signs or to finish standard signs. The hand-painting of signs is not acceptable.

SIGN INSPECTION: Routine day-to-day inspection of signs is required to keep up with signing needs. Daylight inspections are not adequate, however, to evaluate the nighttime effectiveness of reflective materials. Nighttime inspections shall therefore be a regular part of each district's signing program.

CONT.

SIGN DATING: In order to secure the full value of any warranty on reflective sheeting and for historical data on sign installation, a dating sticker shall be placed on all signs. The month and year shall be punched on the sticker before it is applied to the back of the sign on the back left-hand edge as you face the sign. The dating stickers also provide a warning to those who would deface or remove sheeting signs. The stickers are available through a vender under a price contract established by the Central Office.

DISPOSAL OF UNUSABLE SIGNS: Aluminum signs considered unusable by the district are to be stored at a centralized district facility and sold for scrap metal in accordance with statewide departmental policy for the disposal of salvage material. Unusable signs of other materials, such as wood or fiberglass board, are to be disposed of in a landfill.

TEMPORARY TRAFFIC-CONTROL REGULATIONS: Signs, markings, and other traffic-control devices that may be required in conjunction with highway construction or maintenance projects and for anyone doing work on state-maintained streets are prescribed in the *MUTCD* and *Kentucky Department of Highways' Standard Drawings*. The *Kentucky Standard Specifications for Road and Bridge Construction* and the project-specific traffic control plan set out contractors' responsibilities to provide such devices on their projects. It is not the responsibility of the division or the district to ensure that these provisions are enforced. However, the district and division are available for consultation if needed.

SIGNS FOR OTHER AGENCIES: At the request of another state agency, the Cabinet may furnish and install signs on property under state control. If the lot or roadway involved has been accepted by the Cabinet for maintenance, the services may be provided at no cost to the requesting agency. In all other cases, the Cabinet will be reimbursed for such work by an intergovernmental agreement.

RESPONSIBILITIES: Refer to the Signing Contacts link on the Division of Traffic Operations homepage for information on the various signing responsibilities.

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TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

One-Way Signing on Bifurcated Highways

ONE-WAY SIGNING: To discourage wrong way travel from public roads or commercial entrances onto rural bifurcated highways where there is no median opening directly in front of the entrance, a ONE WAY sign (R6-1 or R6-2) should be installed on the opposite side of the road facing the entrance.

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TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

Passing Regulations

DO NOT PASS & PASS WITH CARE SIGNS:

While not normally used, DO NOT PASS (R4-1) and PASS WITH CARE (R4-2) signs may be used to supplement the NO PASSING ZONE sign (W14-3) at the discretion of the district.

DO NOT PASS signs should be installed for all downhill no-passing zones in conjunction with truck-climbing lanes. See **Exhibit 5** for placement.

PASS ONLY WHEN CENTER LANE IS CLEAR SIGNS:

A PASS ONLY WHEN CENTER LANE IS CLEAR sign should be installed at the end of no-passing zones on roads where a passing lane has been added for opposing traffic. See **Exhibit 5** for placement.

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TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

NO U-TURN Signs

NO U-TURN SIGNS: A NO U-TURN sign (R3-4) shall be installed on any approach of a multi-lane highway where U-turns on a protected left-turn phase conflict with a right-turn overlap on the cross street. A multilane highway is defined as any roadway with two or more through lanes in each direction. A NO U-TURN sign may also be installed on other roadways if a similar conflict is present. The sign may be installed overhead or post-mounted.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

Truck Lane Restrictions

PROCESS: Prohibitions may be established by Official Order to restrict trucks with more than six wheels to the right two lanes of a fully controlled access highway with six or more lanes in rural areas. Requests for such restrictions should be sent to the division for evaluation.

SIGNING: Dual-mounted TRUCKS USE RIGHT 2 LANES signs shall be installed at:

- The beginning of the section
- The end of the sequence of post-interchange signs in each direction after each exit on the affected section of highway

Dual-mounted END TRUCK LANE RESTRICTION signs shall be installed at the end of the sections.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

Speed Regulations

STATUTE: Kentucky Revised Statute (KRS) 189.390 establishes statutory speed limits and the procedures for altering such limits.

REQUESTS: Requests for speed limit revisions are to be reviewed by the district. The district shall perform an engineering study as outlined in Section 2B.11 of the *Manual on Uniform Traffic Control Devices* to determine the appropriate speed limit.

If the district feels that a speed limit revision is justified based on the results of the study, it shall forward the following information to the division with a recommendation:

- Ø Results of speed studies including 85th percentile speeds
- Ø Crash history for a three-year period
- Ø Descriptions with milepoints for all proposed and existing speed zones

If the division agrees with the recommendations, the division shall ask the district to obtain local comment. Once this information is received, the division shall forward an Official Order to the Secretary of Transportation for approval. Once approved, the Official Order will be forwarded to the district for posting of signs. After posting Speed Limit signs (R2-1), the district shall send an e-mail to the division indicating the date the signs were installed.

GENERAL: Intersections and roads with undesirable alignment are not usually in themselves sufficient justification for reduced speed limits, as the speed reductions required for these conditions can usually be achieved by the installation of warning signs and advisory speed plates.

Generally, no reduced speed zone will be necessary through an area that does not meet the statutory requirements for a business or residential district. Speed zones are related to roadside development and have no relation to city limits.

CONT.

GENERAL (cont.): It is the continuing responsibility of the district to review all speed limits to determine if the limits are reasonable, adequate, and appropriate.

Copies of all Official Orders are kept by the division and are available upon request.

TRANSITION SPEED ZONES: Transition speed zones may be used to guide motorists from a higher rural speed limit to a lower urban speed limit. The normal speed transitions are from 55 mph to 45 mph and 35 mph to 25 mph.

Advance warning of speed transitions from rural to urban conditions shall be signed using the SPEED REDUCTION sign (W3-5, shown below). In situations where the transition in speed limits is greater than 10 mph, the SPEED REDUCTION signs and SPEED LIMIT signs should be dual-mounted.

W3-5

The speed limit displayed on the SPEED REDUCTION sign shall be identical to the speed limit displayed on the subsequent SPEED LIMIT sign.

SPEED LIMIT SIGNS IN COMMUNITIES: When transitioning from an area with a rural speed limit to an area with an urban speed limit on conventional highways, the first SPEED LIMIT sign encountered should be 36” x 48” to emphasize the location of the change in speed limit. If roadside conditions will not permit the installation of a 36” x 48” sign, dual-mounted 24” x 30” signs should be considered as an alternative. If dual-mounting is not possible, a single mounted 24” x 30” sign may be used.

Other SPEED LIMIT signs installed on conventional highways within a community should be 24” x 30”.

END XX SPEED LIMIT SIGN: At locations where the speed limit changes to 55 mph and the roadway alignment is undesirable, an END XX SPEED LIMIT sign may be installed instead of a 55 MPH SPEED LIMIT (R2-1) sign.

CONT.

SCHOOL SPEED LIMITS:

School speed limits may be established according to KRS 189.390 and 189.336 for public or private schools if both of the following criteria are satisfied:

- Ø The school property is adjacent to a state-maintained facility.
- Ø The student enrollment is equal to or greater than 100 in kindergarten through 12th grade.

SCHOOL SPEED LIMITS (cont.):

Preschools, day cares, head starts, and postsecondary facilities are not eligible.

The school speed limit should normally be 10 mph lower than the normal posted speed limit, not less than 25 mph and not more than 45 mph. Unusual sight distance restrictions, roadway conditions, or crash history may justify reductions greater than those listed above.

School speed-limit signing should normally consist of a SCHOOL SPEED LIMIT sign (S5-1) with yellow flashing beacons as discussed in **Chapter TO-611.**

An END SCHOOL ZONE sign (S5-2) shall be installed at the end of the school speed zone. A SPEED LIMIT sign (R2-1) for the following section of highway may be used instead of the END SCHOOL ZONE sign if conditions dictate.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

STOP Signs at Railroad Crossings

STOP SIGNS AT RAILROAD CROSSINGS:

According to Kentucky Revised Statute 189.560, if a railroad crossing has been designated by Official Order as "unsafe," a 30-inch x 30-inch or larger STOP sign (R1-1) shall be installed at the marked stopping position or, if the stopping location is not marked on the pavement, not more than 25 feet in advance of the tracks.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

Median Crossover Signs

MEDIAN CROSSOVER SIGNS:

The district shall install and maintain median crossover signs at each median crossover on limited-access facilities that are divided. The signs shall be the "No U-Turn" symbol sign (R3-4). At crossovers on medians 60 feet wide or less, signs for each direction of travel shall be mounted back-to-back in the center of the median and perpendicular to the roadway. At crossovers on medians over 60 feet wide, the signs for each direction of travel shall be mounted on separate posts. The signs shall be located at the median shoulder on the far side of the crossover.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

Anti-Littering Signs

ANTI-LITTERING SIGNS:

Black-on-white 48-inch x 60-inch $500 FINE FOR LITTERING signs may be installed on fully controlled access highways at the discretion of the district. On entrance ramps or conventional roads, 30-inch x 36-inch signs may be installed.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

Stop Control at Intersections

RIGHT-OF-WAY ASSIGNMENT:

Kentucky Revised Statute (KRS) 189.330 assigns the right of way to certain traffic streams at intersections. It further provides that the State Highway Commissioner, with reference to state highways, may designate an intersection as a stop intersection or a yield intersection and erect STOP (R1-1) or YIELD (R1-2) signs at one or more approaches to such intersections. YIELD signs shall not be used to assign right of way for an entire approach at any intersection. However, they may be used to assign right of way for turning movements.

The district shall be responsible for the proper right-of-way assignments, including multi-way stop control, using an engineering study in accordance with the *Manual on Uniform Traffic Control Devices*.

CROSS TRAFFIC DOES NOT STOP SIGNS:

In all cases where multi-way stop control is converted to standard stop control at an intersection, black-on-white CROSS TRAFFIC DOES NOT STOP (W4-4P) plaques shall be installed under the remaining STOP signs.

COUNTY/CITY APPROACHES:

The installation/maintenance of STOP signs on county or city approaches to intersections with state-maintained roads shall be in accordance with KRS 189.330.

PUBLIC NOTIFICATION:

Along with any sign(s) changing the right-of-way assignment(s), the public shall be informed of the change in advance in the form of a press release to the media, variable message signs, and/or fixed signs.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

KEEP RIGHT EXCEPT TO PASS Signs

KEEP RIGHT EXCEPT TO PASS SIGNS

Kentucky Revised Statute 189.340 requires vehicles to drive in the right-hand lane except to pass another vehicle on limited-access highways with four or more lanes and a posted speed limit of 65 mph. In an effort to inform motorists of this requirement, KEEP RIGHT EXCEPT TO PASS signs should be installed on all facilities that meet this definition. The signs should be installed at all ports of entry into Kentucky and at the end of the series of post interchange signs at each entrance ramp.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

Weight Limit Signs

BRIDGE WEIGHT LIMIT SIGNS: Weight limit signs similar to R12-1 but a minimum of 24 inches x 30 inches in size carrying the appropriate weight restriction shall be installed at the leading edge of all bridges that have a weight limit less than that established by the class of roadway on which they are located. Appropriate weight restrictions can be obtained from the Division of Maintenance, District Bridge Engineer, and 603 KAR 5:066. These signs may be supplemented with advance-warning signs.

2 2 2

TRAFFIC OPERATIONS

Section

REGULATORY SIGNS

Subject

NO TURN ON RED Signs

AUTHORITY: Kentucky Revised Statute 189.338 permits vehicles facing red signal indications to turn right after stopping at all signalized intersections. In addition, left turns are permitted after stopping at signalized intersections from a one-way street to a one-way street. The Cabinet may install signs prohibiting such movement when it is determined that such turns would be hazardous or otherwise undesirable.

SIGNING: The sign used for this purpose shall be the NO TURN ON RED sign (R10-11a or R10-11b). The sign shall be mounted to the right of the right signal face for prevention of right turns and to the left of the left signal face for prevention of left turns. The sign may be post-mounted adjacent to the roadway when it is impractical to install the sign adjacent to the signal face.

CRITERIA: Turns on red should be prohibited in the following cases:

Ø Sight distance of vehicles approaching from the left is less than the following minimums:

Cross Street Speed Limit (mph)	Minimum Sight Distance (ft)*
25	240
30	290
35	335
40	385
45	430
50	480
55	530

*Sight distance is measured from the stop bar if pedestrian crosswalks are marked. If crosswalks are not marked, sight distance is measured from the edge of the cross street pavement or curb line.

Ø The intersection has more than four approaches or has restricting geometrics that cause additional conflicts. The restriction should apply to only those approaches that have multiple or unusual conflicts that are not easily identified by the motorists.

CONT.

CRITERIA (cont.):

- Ø There is an exclusive pedestrian phase during which pedestrians can cross all crosswalks.

- Ø The intersection is within 200 feet of a railroad grade crossing, and the signal controller is preempted during train crossings. The prohibition should apply only to the approach from which turns are made toward the railroad-crossing lane.

Turns on red may be prohibited where:

- Ø Significant pedestrian conflicts result from turn on red maneuvers

- Ø More than one turn on red accident per year has been identified for any particular approach

- Ø There is an unusual movement, such as dual left turns, from opposing traffic that would not be anticipated by the right-turn on red driver

- Ø There are school crossings or any areas where there are large numbers of children expected

APPROVAL: The district is responsible for the approval of these signs.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

CONGESTED AREA Signs

CONGESTED AREA SIGNS:

The use of a CONGESTED AREA sign is authorized where congestion represents a hazard to motorists and where such congestion is not readily apparent to approaching traffic.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

Roadway Surface Condition Signs

ICE POSSIBLE AHEAD SIGNS: At locations where water has a tendency to pond and freeze, ICE POSSIBLE AHEAD signs may be installed.

HIGH WATER POSSIBLE SIGNS: At locations with frequent flooding, HIGH WATER POSSIBLE signs may be installed.

SLIPPERY WHEN WET SIGNS: SLIPPERY WHEN WET signs (W8-5) may be installed using the following process:

1. The district Traffic Engineering and Permits Section shall serve as the primary contact for requests involving pavement slickness. In order to minimize the number of unnecessary skid tests, the initial investigation should rule out other potential contributing factors to wet pavement crashes such as rutting, ponding of water, high shoulders, and other drainage issues. The Project Delivery and Preservation Branch should be contacted to assist in evaluating these concerns. Other contributing factors may include poor visibility, signing, geometry, etc. If skid resistance is considered the likely problem upon completion of the initial investigation, testing shall be requested.

2. The district shall submit a request for skid testing directly to the Division of Materials. A copy of this request (along with supporting documentation) shall be sent to Central Office Division of Traffic Operations.

3. The Division of Materials shall conduct the test and forward the results to the Division of Traffic Operations, Division of Maintenance, and the district traffic engineer.

4. The following actions shall be taken based on the results of the skid test:

CONT.

Skid Number	Action
39 or Greater	No further action is necessary
27 to 38	Section will be incorporated into the resurfacing program evaluation process with demerit points assigned for friction. These pavements should continue to be tested on a regular schedule until treatment is applied. SLIPPERY WHEN WET signage should be installed for pavements in this range.
26 or Below	Improvement should be given a high priority. Alternative treatments and funding sources should be considered if the pavement is not a good candidate for resurfacing. SLIPPERY WHEN WET signage should be installed for pavements in this range.

5. Regardless of the results of the skid test, SLIPPERY WHEN WET signs may be installed by the district if the crash data suggests a crash pattern that may be addressed by the installation of these devices.

6. SLIPPERY WHEN WET signs shall be removed when the surface conditions that warranted the signing have been addressed.

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

NO PASSING ZONE Signs

NO PASSING ZONE SIGNS:

NO PASSING ZONE signs (W14-3) should be used to supplement no-passing pavement markings on roads with an ADT of 1,000 or greater. The signs may be used on other roads at the discretion of the district.

On those roads where the NO PASSING ZONE signs are used, the end of each passing zone may be marked with a delineator post with three white delineators or with the top six inches painted white. The purpose of the delineator is to assist with remarking the no-passing zone.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

PREPARE FOR SUDDEN STOP Signs

PREPARE FOR SUDDEN STOP SIGNS: PREPARE FOR SUDDEN STOP signs may be installed to warn of the potential of stopped traffic at locations with a rear-end crash pattern or at locations that regularly experience traffic congestion.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

Low Clearance Signs

CRITERIA: Clearances for structures shall be signed if less than 14 feet, 6 inches, above the surface of the roadway or shoulder. Special consideration may dictate the signing of clearances greater than one foot above the statutory maximum vehicle height (Kentucky Revised Statute 189.222). Care should be taken in determining actual vertical clearance from the roadway surface to ensure consideration is given to the most extreme legal vehicle dimensions that can be expected, especially on superelevated sections and sag vertical curves.

SIGNS: Standard warning signs (W-12-2 or W12-2P) shall be used to sign for low clearances. The dimension displayed on the sign shall be three inches less than the actual measured clearance.

PROJECTS: To determine if revised signing is necessary, District Construction/ Maintenance shall notify District Traffic upon application of new surface material.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

Steel Bridge Deck Signing

CRITERIA: Steel bridge decks may present problems to motorcyclists, particularly when they are unaware of the condition before entering the bridge. The district shall install and maintain signs for the purpose of warning motorcyclists of the existence of such bridge decks.

LOCATION: These signs should be placed at the appropriate distance in advance of the bridge to give adequate warning of this condition. This placement should be in accordance with the normal installation of warning signs.

SIGNS: The sign assembly shall consist of warning sign with the message STEEL BRIDGE DECK AHEAD. A supplemental sign shall be added beneath this sign, which shall be a rectangular shape with the message ATTENTION MOTORCYCLISTS.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

Transition Area Signing

TRANSITION AREA SIGNING: The transition area between four-lane and two-lane roadway sections should be signed according to **Exhibit 6.** Signs R4-7, W6-1, and W6-2 may be omitted if the four-lane roadway is undivided.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

HILL/SLOW MOVING TRUCKS Signs

HILL/SLOW MOVING TRUCKS SIGNS: On high-speed roads having occasional steep grades for uphill traffic, it is sometimes necessary to warn motorists of slow-moving trucks to address rear-end collisions. The HILL (W7-1a) sign may be supplemented with a plaque displaying the message SLOW MOVING TRUCKS.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

FALLEN ROCK ZONE Signs

FALLEN ROCK ZONE SIGNS: In deep cut sections and other locations where fallen rock presents a potential hazard, warning signs with the legend FALLEN ROCK ZONE may be installed.

2 2 2

TRAFFIC OPERATIONS

Section

WARNING SIGNS

Subject

BRIDGES FREEZE BEFORE ROADWAY Signs

BRIDGES FREEZE BEFORE ROADWAY SIGNS:

Use of BRIDGES FREEZE BEFORE ROADWAY signs should be limited to high-speed rural highways such as interstates, parkways, and major primary roads. On such facilities, these signs should be installed near the beginning of the route, after leaving metropolitan areas, and at 25- to 50-mile intervals along the route. They may also be installed on the approaches to bridges if additional emphasis is deemed necessary.

2 2 2

TRAFFIC OPERATIONS

Chapter

WARNING SIGNS

Subject

Share the Road Plaques

ELIGIBILITY: SHARE THE ROAD (W16-1) plaques may be used to supplement warning signs for other slower forms of transportation traveling along the highway. A SHARE THE ROAD (W16-1) plaque may be used with the following signs:

- Bicycle Traffic (W11-1)
- Equestrian Traffic (W11-7)
- Horse and Buggy Traffic (W11-14)
- Farm Machinery Traffic (W15-1)

SIZE: Standard SHARE THE ROAD (W16-1) plaques shall be used. When plaques supplement signs 36" x 36" or larger, plaque size shall be 24" x 30". Plaques that supplement smaller warning signs shall be 18" x 24".

COLOR: SHARE THE ROAD (W16-1) plaques shall match the color of the warning sign they supplement.

BICYCLE WARNING/SHARE THE ROAD SIGNS: The Bicycle Warning and Share the Road sign assembly should be installed where there is a need to warn motorists to watch for bicyclists traveling along the highway.

If requested, Bicycle Warning (W11-1) signs supplemented with SHARE THE ROAD (W16-1) plaques shall be installed on any federally, state, or locally approved bicycle routes. As a general rule, sections of highway with designated bicycle lanes shall not be eligible for this type of signing due to the unlikelihood of conflicts between vehicles and bicycles and since standard bike lane signing and markings provide sufficient warning of bicycle activity. Likewise, highways with paved shoulders wide enough to accommodate bicycle traffic are normally not eligible for this type of signing unless special safety hazards or road courtesy problems exist.

CONT.

To have maximum effect, these signs should not be installed indiscriminately. They should only be installed in areas where one or more of the following criteria are met:

- Documented crash history involving bicyclists
- High concentration of bicycle traffic
- Geometric deficiencies in roadway that might result in increased conflicts between vehicles and bicycles

Requests for Bicycle Warning and Share the Road sign assemblies should normally come from a municipality or other responsible party (such as a recognized bicycle board or committee). The following process should be followed for such requests:

1. The requesting agency shall fill out a Bicycle/Share the Road Warning Sign Request Form **(Exhibit 21)**.
2. The requesting agency shall forward the request form to the Bicycle and Pedestrian Coordinator in the Office of Special Programs.
3. The Bicycle and Pedestrian Coordinator shall forward the request to the Division of Traffic Operations.
4. The Division and District shall review the request and notify the Bicycle and Pedestrian Coordinator of their recommendation.
5. The Bicycle and Pedestrian Coordinator shall notify the requesting agency of the results of the Cabinet's review.

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Introduction

OVERVIEW: The guide sign section in this chapter primarily addresses signing on conventional highways unless otherwise specified. In these sections, the term *conventional highway* refers to state highways except interstates, parkways, or roads with an ADT of less than 400.

COLOR: Guide signs shall consist of a white message and border on a green background unless otherwise specified.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Route Signs

INSTALLATION: Route signs and Route Sign assemblies, including Junction, Advance Route Turn, and Directional assemblies, shall be installed for all numbered state routes with the exception of frontage roads and other roads that are numbered mainly for maintenance purposes. Confirming assemblies should be installed for all numbered state routes and shall be supplemented with Cardinal Direction auxiliary signs to indicate the general direction of the route. The direction signed shall be the same as the direction listed in the *Official Milepoint Route Log*.

The decision to install these signs shall not be based on whether the route number is greater or lower than a certain number. However, routes with low volumes of traffic should have a low priority.

SIGNS: Colors and layouts of Route signs vary depending on the type of highway.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

FORMERLY Signs

INSTALLATION: When route numbers are changed on any state highway, the old route number should be posted along with the new route number as a convenience to motorists.

The procedure for installation is as follows:

1. Install new route marker.
2. Add a sign with the message FORMERLY below the new route marker.
3. Install the old route marker below the FORMERLY sign.

TIMEFRAME: The FORMERLY signs should be left in place for approximately one year.

COLOR: The FORMERLY signs shall have a black message and border on a white background.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Destination & Distance Signs

PURPOSE: Destination and Distance signs supply the road user with information concerning the destinations that can be reached by highways.

DESTINATIONS: Normally, city and town names should be used on Distance and Destination signs. In rare cases, other traffic generators may be used as destinations. However, privately operated commercial developments shall not be used as destinations on these signs.

LOCATIONS: Destination or Distance signing should be provided at intersections with numbered highway routes to inform motorists of destinations that can be reached from the intersecting route.

Destination or Distance signing shall be provided at ramp termini for cities and other destinations that are referenced on the Advance or Supplemental Guide signs for an interchange.

DISTANCE MEASUREMENTS: Measurements on Distance signs for cities and towns should be the distance between the sign location and the center of the community (examples include courthouses, central business districts, etc.).

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Street Name Signs

INTERSECTION SIGNS:

The Cabinet allows cities or counties to install Street Name (D3) signs at intersections with state highways. These signs should have a white legend and border. While green is preferred for the background color, other background colors (with the exception of red) are acceptable.

SPAN-MOUNTED SIGNS:

The district may install or permit the local agency to install span-mounted Street Name signing at signalized intersections on multi-lane state highways. Signs may be installed using one of the following methods:

- Ø By the district at its own expense
- Ø By a local agency through the permit process
- Ø By the district with reimbursement from a local agency for the costs associated with the installation

ADVANCE SIGNS:

Advance Street Name signs may be installed at signalized intersections on multi-lane state highways where Street Name signing has been installed at the intersection. These signs may be installed using one of the following methods:

- Ø By the district at its own expense
- Ø By a local agency through the permit process
- Ø By the district with reimbursement from a local agency for the costs associated with the installation

Condition A of Table 2C-4 of the *Manual on Uniform Traffic Control Devices* should be used to determine the appropriate location of these signs in advance of the intersection.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Numbering of Signalized Intersections

INSTALLATION CRITERIA:

The district may install or permit the local agency to install span-mounted signs for the purpose of numbering signalized intersections within a community. These signs may be installed using one of the following methods:

- Ø By the district at its own expense
- Ø By a local agency through the permit process
- Ø By the district with reimbursement from a local agency for the costs associated with the installation

Such signing shall not be installed if span-mounted Street Name signing is installed at the intersection.

NUMBERING SYSTEM:

Before installing such signing, the district should consider the problems associated with the future addition of signals between existing signals along the corridor. Such an installation may require an extensive renumbering effort and/or affect citizens and businesses that have grown accustomed to or printed business materials utilizing the original signal number.

Due to the potential impacts of this type of signing, the district will be required to develop its own numbering system.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Emergency Service Signs on Conventional Highways

ELIGIBLE SERVICES: Emergency Service signing shall be provided only for the following services:

- Ø Police
- Ø Hospitals

LOCATIONS: Emergency Service signs should be provided only along major state highways within a 10-mile radius of the emergency facility.

In cases where Emergency Service signs have been installed at an interchange for an interstate or parkway, signs shall be installed from the ramp termini to the facility or to the last intersection with a state-maintained highway. If the main entrance to the facility is not located directly off a state-maintained highway, signing shall not be installed unless sufficient signing has been installed off the state-maintained system to direct motorists to the facilities.

COLOR: Emergency Service signs shall have a white legend and border on a blue background.

POLICE SIGNS: The district shall install signs only on conventional highways for the following law enforcement facilities:

- Ø State Police Posts
- Ø Other public law-enforcement facilities that are open to the public 24 hours per day, 7 days a week

The sign legend may include the name of the State Police Post or law-enforcement agency.

CONT.

HOSPITAL SIGNS:

The district shall install signs only on conventional highways for licensed hospitals that satisfy the following criteria:

- Ø Provide 24-hour service, 7 days per week
- Ø Have emergency facilities with a physician or emergency-care nurse on duty who is trained in emergency medical procedures

The name of the hospital shall not be included in the sign legend.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Tourist Information Signs

NEW INSTALLATIONS: All requests for new Tourist Information signs on conventional highways or at interchanges on controlled access highways shall be reviewed by the division in conjunction with the Transportation and Tourism Interagency Committee. Signs on conventional highways shall be installed through the Cultural and Recreational Guide sign process (see **Section TO-404-33).**

COLOR: Signs for tourist information centers installed through the Cultural and Recreational Guide sign process shall have white letters and borders on a brown background.

EXISTING SIGNS: Existing white-on-blue Tourist Information Center signs on conventional highways may remain in place until knocked down or for the remainder of their useful life. Replacements for these signs shall be reviewed through the Cultural and Recreational Guide sign process.

When existing signs for tourist information centers are located on conventional highways in an area where a local government has applied for cultural and recreational guide signs, the existing signs shall be included in the review process of the permit application and may be replaced or removed.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Tourist-Oriented Directional Signs

PURPOSE: Tourist-oriented directional signs (TODS) provide directional information for tourist activities offering goods and services that are of significant interest to the traveling public.

PLACEMENT: The Cabinet may permit the installation and maintenance of TODS on conventional routes only.

PROCEDURES: 603 Kentucky Administrative Regulation 4:040 sets forth the procedures to be followed in the installation and maintenance of these signs.

COLOR: Signs shall have a white legend and border on a blue background.

CONTACTS: All questions regarding TODS issues should be forwarded to the Permits Branch of the Division of Maintenance or the statewide contractor selected to administer the TODS program. The contractor is responsible for the marketing, determination of eligibility, maintenance, installation, and removal of these signs.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Reference Location Signs

INSTALLATION & MAINTENANCE: The district shall install Reference Location signs on state highways based on the *Official Milepoint Route Log*. Since the *Official Milepoint Route Log* is the basis for the identification of many field activities, Reference Location signs should be maintained to a high standard.

LOCATIONS: When a Reference Location sign cannot be erected in its correct location, it may be moved in either direction as much as 50 feet. If it cannot be placed within 50 feet of its correct location, it shall be omitted.

MOUNTING: Signs shall be mounted at a minimum height of four feet and at a lateral placement equal to that used for normal roadway signing.

UNDIVIDED HIGHWAYS: On undivided highways, signs shall be located on the right-hand side of the road for traffic heading in the cardinal direction listed in the *Official Milepoint Route Log*. Signs shall be mounted back-to-back so that the number is visible from both directions of travel.

DIVIDED HIGHWAYS: On divided highways, signs shall be set for both directions of travel. The sign for the southbound or westbound direction of divided highways shall be set at locations directly opposite the sign for the northbound or eastbound direction.

RECONSTRUCTED OR NEW ROUTES: The construction of new routes or reconstruction of existing routes will require the installation of new Reference Location signs. Reconstruction may require the relocation of Reference Location signs on existing routes beyond the reconstruction. The location of new or relocation of existing Reference Locations signs should be coordinated with District Planning.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Enhanced Intermediate Reference Location Signs

PURPOSE: Enhanced Intermediate Reference Location signs (EIRLS) serve as aids in providing location information to assist road users. These signs also provide a means for identifying the location of emergency incidents and traffic crashes.

PROCEDURES: Based on available funding and determination of need, EIRLS may be installed and maintained by the Cabinet. The division shall maintain a listing of highways eligible for EIRLS.

Local governmental agencies may install EIRLS on highways not on the EIRLS listing through the permitting process. The permit application shall contain a plan for the installation of the signs including the number of signs and their locations. Installation and maintenance of the signs, including replacement, shall be the sole responsibility of the local governmental agency seeking approval for installation. All permits for such signing shall be submitted to the division for review and comment.

LOCATIONS: EIRLS may be installed in urban areas on the mainline and interchange ramps of limited-access multilane highways and other highways covered by freeway service patrols. When mainline EIRLS are installed, additional signs shall be installed on freeway-to-freeway or other complex interchanges including large collector distributor systems. Signs may be installed at other interchanges as needed.

Outside of urban areas, these signs may be installed in the presence of elevated structures, median barriers, or any other natural or man-made impediment to emergency-vehicle access to either side of a freeway facility. These impediments include bifurcated alignments, extra-wide medians, and wooded medians.

CONT.

LOCATIONS (cont.):

Locations of sign installations shall be based on the following:

- Ø Signs shall be spaced 0.2 miles apart unless a different spacing is approved by the division.
- Ø Signs should be installed on median barrier wall when present; otherwise on the right-hand side of the roadway. Where conditions limit or restrict the use of signs on the right-hand side of the roadway, they may be installed in the median.
- Ø On two-lane highways, signs shall be installed on one side of the roadway only and shall be installed back-to-back.
- Ø Signs shall not be placed farther than 30 feet from the edge of the pavement.

COLOR:

EIRLS shall have a blue background. For the legacy systems in Louisville/Southern Indiana (TRIMARC) and Northern Kentucky/Cincinnati (ARTIMIS), the existing design for the existing EIRLS may be used.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

County Line Signs

COUNTY LINE SIGNS:

County Line signs shall be installed at county borders on interstates, parkways, and highways on the National Highway System. At its discretion, the district may install these signs on other state highways.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

City Limits Signs

CRITERIA: In accordance with Kentucky Revised Statute 177.037, the district may install City Limits signs on state highways to recognize the boundary of a city, town, or community that has a post office, whether incorporated or unincorporated. Signs shall be installed regardless of whether the community has a post office if the Cabinet had previously erected signs recognizing the city, town, or community. Signs shall not be installed for fire districts, water districts, areas with obscure political boundaries, or communities within cities (such as East Manchester).

LEGEND: The legend on these signs shall include only the place name. However, the legend CITY LIMITS may be included under the place name if desired. The use of other copy shall not be permitted.

LOCATIONS: Signs shall be located at the official community boundaries. The boundaries shall be determined by official city maps or by local officials if maps are not available. In qualifying communities that do not have official boundaries, signs shall be installed at the limits of the built-up area.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Community Boundary Signs for Cities or Unincorporated Urban Places

PROCEDURES: The district shall install signs at the boundaries of any city of the first through sixth class or an unincorporated urban place if the official governing body of the city, town, community, or unincorporated urban place submits a written request to the district for such signing. Boundary signs may be installed to honor an event or accomplishment important to the area (including sports accomplishments) or the birthplace of a person important to the area.

Detailed procedures regarding the installation of these signs are outlined in Kentucky Revised Statute 177.037 and 603 Kentucky Administrative Regulation 4:045.

INSTALLATION COSTS: The cost of the preparation and installation of these signs shall be the responsibility of the local government requesting the signs. The district shall not install these signs until payment has been received.

MAINTENANCE RESPONSIBILITY: Maintenance of these signs shall be the responsibility of the district.

COLOR: Signs shall have white copy on a green background. The color of the legend and background shall not be modified to match school colors for signs honoring school accomplishments.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Community Boundary Signs for Counties

DISCUSSION: In addition to the rules and regulations set forth in Kentucky Revised Statute 177.037 and 603 Kentucky Administrative Regulation 4:045, the district may install and maintain community boundary signing at county borders on state highways other than interstates or parkways.

QUALIFYING CRITERIA: Qualification for this type of signing shall be based on the following criteria:

- Ø These signs shall honor the birthplace or home of an important individual or an event or accomplishment (including school accomplishments) important to the county.
- Ø Only one event, accomplishment, or person may be honored per county.
- Ø Signs installed to honor school accomplishments shall be limited to academic and athletic teams (including bands) of public and private schools. Qualifying teams shall be composed of 10 or more individuals and have won a statewide or nationwide competition.
- Ø These signs shall not be permitted at county lines if boundary signs have been erected to honor the same individual or accomplishment at a city or unincorporated urban place within the county borders.

PROCEDURES: The following procedures should be followed when installing these signs:

1. Written requests for such signing shall come from the local county government and include the following:
   - Ø Proposed message on the sign
   - Ø Specific historical significance of the event, individual, or accomplishment that is being honored
   - Ø Official resolution from county government in support of the sign installation
   - Ø Commitment from the local government to reimburse the Cabinet for the cost of making and installing the signs

CONT.

PROCEDURES (cont.):

2. The district shall submit an itemized bill to the requesting governing body for labor and materials associated with making and installing these signs.

3. Signs shall not be installed until payment has been received.

MOUNTING & LEGENDS: Sample legends for these signs include HOME OF (EVENT), HOME OF (TEAM AND ACCOMPLISHMENT), or BIRTHPLACE OF (INDIVIDUAL).

These signs shall be mounted below the standard County Line signs. If desired, the County Line and boundary sign messages may be combined onto a single sign. If the message is on a separate sign, the minimum mounting height shall be maintained from the ground to the bottom of the lowest sign.

COLOR: Signs shall have white copy on a green background. The color of the legend and background shall not be modified to match school colors for signs honoring school accomplishments.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Certified Sign Assemblies

QUALIFYING PROGRAMS: Programs approved for this type of signing include: Certified Clean, Certified Healthy, Certified Ready and Prepared, and Storm Ready Communities.

APPROVAL AGENCIES: The following agencies shall determine eligibility for this type of signing:

- Certified Clean – Environmental and Public Protection Cabinet
- Certified Healthy – Governor's Office of Wellness and Physical Activity
- Certified Ready and Prepared – Kentucky Office of Homeland Security
- Storm Ready – Kentucky Weather Preparedness Committee

LOCATIONS: The location of signs shall be installed in accordance with the following criteria:

- Signs shall only be installed for a community that qualifies the approved programs.
- Signs shall only be installed by the District when notified by an approval agency.
- Signs shall not be installed on interstates or parkways.
- Signs shall be installed on no more than two routes on both approaches to a community (no more than four total sign assemblies).
- The District shall contact local officials for concurrence on the location of these signs.
- Signs shall be installed beyond but no closer than 200 feet to the community boundary sign.

CONT.

SIGN ASSEMBLIES:

Sign assemblies shall be constructed using 42” x 10” white on green signs and a 5” legend. The top sign shall have the legend CERTIFIED. If the qualifying community is a city, the legend on the bottom sign in the assembly shall be CITY. If the qualifying community is a county, the legend on the bottom sign in the assembly shall be COUNTY. Approved legends for signs in between the top and bottom signs include:

- CLEAN
- HEALTHY
- READY & PREPARED
- STORM READY

If a community qualifies for more than one of these programs, the appropriate signs shall be installed from top to bottom in the order shown (CLEAN on top, STORM READY on bottom). Minimum vertical clearance shall be maintained as additional signs are added. Sample layouts of sign assemblies for qualifying communities are shown below:

RESPONSIBILITY FOR COSTS:

The Cabinet shall be responsible for the costs of installing and maintaining these signs.

TRAFFIC OPERATIONS

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GUIDE SIGNS

Subject

School Accomplishment Signs

PROCEDURES: The district may install signs to recognize accomplishments of school teams near the entrance to the school.

The following procedures should be followed when installing these signs:

1. Written requests for such signing shall come from a school agency and include the following:

   Ø Proposed message on the sign

   Ø Verification that the qualifying criteria are satisfied

   Ø Commitment to reimburse the Cabinet for the cost of making, installing, and maintaining the signs

2. No more than two accomplishments shall be signed for at each school.

3. The district shall submit an itemized bill to the school agency for the costs associated with making and installing these signs.

4. Signs shall not be installed until payment has been received.

5. Signs shall be installed for one year. At the end of this time period, the signs shall be removed and given to the school agency that originally requested the signs.

QUALIFYING CRITERIA: Signs shall be installed only if the following criteria are satisfied:

Ø Accomplishment involved an academic or athletic team (including bands) of a public or private school

Ø Accomplishment involved a team composed of 10 or more individuals that won a statewide or nationwide competition

CONT.

QUALIFYING CRITERIA (cont.):

- Ø Championship was won within the last 12 months
- Ø The school's entrance is located on a state highway

LOCATION: Signs shall be installed within 500 feet of the main school entrance.

COLOR: Signs shall have white copy on a green background. The color of the legend and background shall not be modified to match school colors.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

WELCOME TO KENTUCKY Signs

CRITERIA: WELCOME TO KENTUCKY signs shall be installed at each port of entry into Kentucky on interstates, parkways, and highways on the National Highway System. At their discretion, the districts may install these signs at the ports of entry on other state highways.

LAYOUT: Layout and color of these signs vary. Copies of the sign layout are available from the Central Sign Shop.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Educational Institution Signs on Conventional Highways

DETAILS: Colleges, universities, and other educational institutions are regarded as destinations that are deserving of guide signs. The extent of the signing to be provided is based on the amount and type of traffic expected to be generated by the various types of institutions. Signing should only be installed at intersections when there is adequate space for additional signs.

LEGENDS: Symbols, logos, or advertising shall not be permitted on these signs. The color and background shall not be modified to match school colors.

COLLEGES & UNIVERSITIES: State-supported colleges and universities, including the Kentucky Community and Technical College System, and not-for-profit independent colleges and universities that are licensed by the Kentucky Council on Postsecondary Education are eligible for signing. Enrollment figures shall be verified using the most recent information published by the Kentucky Council on Postsecondary Education. For-profit institutions shall not be eligible for signing.

Institutions with total enrollments of 1,000 students or greater for at least one reporting period (quarter, semester, etc.) of the most recent school year should be signed as follows:

- Ø Signing should be installed at major intersections within a 5-mile radius for institutions with enrollments greater than 5,000 students. For enrollments lower than 5,000 students, a 2-mile radius should be utilized. Signing should not be provided on roads of local usage only.

- Ø Signing should be provided at the main entrance to the institution unless the institution has installed on-site signing that would eliminate the need for signs on the roadway.

- Ø If the school qualifies for signing at interchanges under the criteria listed in **Section TO-404-38,** adequate signing shall be provided from the interchange to the institution.

CONT.

COLLEGES & UNIVERSITIES (cont.):

Institutions with total enrollments of fewer than 1,000 students for one reporting period (quarter, semester, etc.) of the most recent school year should be signed as follows:

- Ø Signing should be provided at the main entrance to the institution unless the institution has installed on-site signing that would eliminate the need for signs on the roadway.
- Ø Signing may be provided one intersection away from the main entrance if conditions indicate a need or if the main entrance is not from a state-maintained roadway.

Branches of the college or university's main campus are eligible for signing according to the above policy except that the enrollment figures used for evaluation shall be that of the branch campus only.

AREA TECHNOLOGY CENTERS:

Area technology centers are eligible for signing as follows:

- Ø Signing should be provided at the main entrance to the institution unless the institution has installed on-site signing that would eliminate the need for signs on the roadway.
- Ø Signing may be provided one intersection away from the main entrance if conditions indicate a need or if the main entrance is not from a state-maintained roadway.
- Ø Signing may be provided at other locations within a two-mile radius of the institution in cases where the facility is difficult to locate.

HIGH, MIDDLE, & ELEMENTARY SCHOOLS:

Public or private high, middle, and elementary schools with an enrollment of at least 100 students are eligible for one sign per direction as follows:

- Ø Signing should be provided at the main entrance to the institution unless the institution has installed on-site signing that would eliminate the need for signs on the roadway.
- Ø If signs are not installed at the main entrance, signing may be provided one intersection away from the main entrance if conditions indicate a need or if the main entrance is not from a state-maintained roadway.

Signing shall not be provided for pre-schools, "head start" programs, or day-care facilities.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Airport Signs on Conventional Highways

AIR CARRIER/ COMMERCIAL AIRPORTS: Airport signs should be installed on major state routes leading directly to the airport within a 15-mile radius of the airport. Signs may also be provided at intersecting routes on approaches to the primary routes within a 10-mile radius of the airport.

GENERAL AVIATION AIRPORTS: Airport signs should be installed on primary state routes leading directly to the airport within a 7.5-mile radius of the airport. Signs may also be provided at intersecting routes on approaches to the primary routes within a 7.5-mile radius of the airport.

PRIVATE AIRPORTS: Guide signs for privately owned airports shall not be installed on state highways.

SIGNS: The Airport (I-5) symbol sign shall be used to sign for airports on conventional state highways. Sign assemblies shall include white-on-green Directional Arrow Auxiliary Signs (M-6 series).

A white-on-green supplemental name plaque with the name of the airport may be included on the trailblazing assemblies to ensure adequate identification for motorists.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Stream & River Name Signs

CONVENTIONAL HIGHWAYS: Stream name signs may be installed where a conventional highway crosses a blue-line stream. Signs for other bodies of water may be installed if they appear on the official state highway map.

INTERSTATES & PARKWAYS: On interstates and parkways, signs shall be installed to identify rivers that appear on the official state highway map. Signs for other bodies of water may be installed if they appear on the official state highway map.

MOUNTING: A separate mounting post for these signs is preferable. When well placed, the sign can serve a dual function by delineating the obstruction near the roadway. Extreme care should be exercised if these signs are affixed to a structure.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Time Zone Signs

LOCATION: To assist motorists, signs shall be installed at the boundary of official time zones on all limited-access highways and other major state highways.

LEGEND: Legends for these signs shall be EASTERN (OR CENTRAL) TIME ZONE.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Signs for Government & Quasi-Government Facilities

QUALIFYING FACILITIES:

The district shall install signs on conventional highways for the following facilities:

- Ø Fire training centers
- Ø Juvenile detention centers
- Ø National and state veterans' cemeteries

The Cabinet may install guide signs on conventional highways for other government or quasi-government facilities that generate a high number of non-local motorists unfamiliar with the area and/or location of the facility. In this section, quasi-government facilities are defined as facilities of nonprofit agencies that receive funding from the government.

Facilities that would commonly qualify for this type of signing include:

- Ø Park and ride lots
- Ø Libraries
- Ø Animal shelters/humane societies
- Ø Landfills
- Ø Department of Highways maintenance facilities
- Ø Transportation Cabinet district offices
- Ø Government facilities with large numbers of general-public visitors (such as courthouses, jails, prisons, driver-licensing facilities, military facilities, post offices, veterans' facilities, parks, etc.)

CONT.

INSTALLATION PROCEDURES:

Engineering judgment should be used to determine if any signs are necessary. If justified, signing should be installed according to the following procedure:

1. Signing should be provided at the main entrance to the facility unless on-site signing has been installed, which would eliminate the need for signs on the highway.

2. If signing is not necessary at the main entrance, signing may be provided one intersection away from the main entrance if conditions indicate a need or if the main entrance is not from a state-maintained highway. Typically, one set of signs will be sufficient for each facility. In rare cases, more signs will be necessary when the facility is difficult to locate. Signs shall not be installed unless other signs have been erected off the state-maintained highway to direct motorists from the intersection to the facility.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Signs for Industrial Parks

PURPOSE: Highways that provide access to industrial parks typically have a significant percentage of truck traffic, and guide signing may improve safety on these routes by minimizing the confusion of truck drivers seeking these facilities. Truck drivers who miss the industrial park access may find themselves traveling on routes with limited options to turn around.

INSTALLATION CRITERIA: The district may install guide signs on conventional highways to assist motorists in finding industrial parks. These signs are not meant to advertise for industrial parks and shall not be installed unless industrial developments have already moved into the park.

LEGEND: Typically, the name of the industrial park should not be included in the sign legend. However, the district may decide to include the name on the sign when:

- Signing for an extremely large industrial park
- Multiple industrial parks are located in the same area and could confuse motorists looking for a particular facility
- The industrial park name has been approved for supplemental guide signs at an interchange

The division is available to assist the district in determining the appropriate legend for industrial park signing on conventional highways.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Adopt-a-Highway Signs

PURPOSE: Adopt-a-Highway signs inform motorists that organizations have taken responsibility for picking up litter along a section of a state highway.

INSTALLATION: These signs are permissible on state highways and shall be installed by the district when notified by their Adopt-a-Highway coordinator.

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GUIDE SIGNS

Subject

WATER PROTECTION AREA Signs

INSTALLATION: These signs shall be installed when requested by the Environmental and Public Protection Cabinet (EPPC), Division of Water. The request will include the desired sign location for the district's review and approval.

RESPONSIBILITY FOR COSTS: The EPPC shall pay for the cost of the signs, and the Cabinet shall pay for the installation costs.

REPLACEMENT OF SIGNS: Replacement signs shall be provided by the EPCC.

LEGEND: Signs shall have the message WATER PROTECTION AREA REPORT SPILLS, with a 1-800 telephone number. Signs that specify the name of a specific watershed area shall not be permissible.

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GUIDE SIGNS

Subject

Crossroad Signs

INSTALLATION CRITERIA: The district shall install signs along interstates and parkways to identify crossing highways without direct access to the interstate or parkway through an interchange.

LEGEND: The identifying signs shall include the system designation and route number of state-maintained highways that cross an interstate or parkway. For local roads, the signs shall include the local road name or route number.

MOUNTING: The signs should be installed near the right-hand bridge pier or end post.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Naming of Highways & Bridges

SIGN LEGEND:

Signs for memorial highways and bridges shall have word messages only and shall not have logos, except as otherwise noted.

NAMING BY PETITION:

Kentucky Revised Statute (KRS) 177.074 allows any unit of local government, civic organization, or other interested party to petition the Cabinet to name a road or bridge on the state primary road system after an individual or historic event or to use any other name that may be of significance to the history of the Commonwealth or any of its counties or communities. 603 Kentucky Administrative Regulation 5:240 includes detailed procedures to be followed for signs installed in this manner.

The costs associated with the preparation and installation of these signs shall be the responsibility of the petitioner. Maintenance of these signs shall be the responsibility of the Cabinet.

NAMING BY LEGISLATION:

In accordance with KRS 177.074, roads and bridges may be named upon direction by joint resolution of the General Assembly.

The fabrication, installation, and maintenance of these signs shall be the responsibility of the Cabinet.

NAMING FOR SLAIN STATE TROOPERS:

Roads or segments of state roads may be named after Kentucky state troopers killed in the line of duty. The procedures for the naming of these highways are outlined in KRS 177.074 (2) through (4).

Signs honoring a state trooper killed in the line of duty shall be white on blue and may contain the official logo of the Kentucky State Police.

The fabrication, installation, and maintenance of these signs shall be the responsibility of the Cabinet.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Historic Trails

INSTALLATION & MAINTENANCE: Signs for historic trails that have been designated by legislation from the General Assembly shall be installed and maintained by the district unless specific instructions are issued to the contrary.

LEGENDS: If requested by the petitioner, historic trails may be signed using unique signs or shields approved by the Cabinet.

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TRAFFIC OPERATIONS

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GUIDE SIGNS

Subject

Scenic Byway Signs

INSTALLATION & MAINTENANCE: In accordance with Kentucky Revised Statute 177.575, the district shall install and maintain appropriate scenic highway identification signs on highways designated as a scenic byway or scenic highway or when notified by the Division of Planning.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Bicycle Route Signs

INSTALLATION CRITERIA: Bicycle Route Guide (D11-1) signs shall be installed on any highway that has been designated as a local, statewide, or national bicycle route, unless Bicycle Route Markers (M1-8 or M1-9) are more appropriate. The signs should be installed at intervals frequent enough to keep bicyclists informed of changes in route direction and to ensure that bicyclists entering from side streets know they are on a bicycle route. These signs may be supplemented with an educational plaque with the specific name of the route.

CONTACT: To verify the eligibility of a highway, the district should contact the coordinator for Bicycle/Pedestrian Programs in the Division of Multimodal Programs.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

State Park Signs

LOCATIONS: Signs for state parks shall be installed according to the following criteria:

- Ø Where Supplemental Guide signs for a state park have been installed at an interchange on an interstate or parkway, sufficient signing shall be installed from the ramp termini to the park or to the last intersection with a state-maintained highway.
- Ø Distance signs shall be located on major routes at approximate distances of 25, 20, 15, 10, and 5 miles from the park entrance.
- Ø Directional signs shall be located at major intersections within 10 miles of the park entrance. The mileage should be included on these signs when possible.
- Ø If an elaborate entrance sign has not been constructed at a park entrance, the Cabinet shall install directional signing at the entrance.
- Ø If the main entrance is not located directly on a state-maintained highway, no signing shall be installed until sufficient signing has been installed off the state-maintained system to direct motorists to the state park.

CULTURAL & RECREATIONAL GUIDE SIGNS: When existing signs for state parks are located within an area where a local government has applied for Cultural and Recreational Guide signs and/or Limited Supplemental signs, they shall be included in the review process of the permit application and shall be replaced with Cultural and Recreational or Limited Supplemental signs.

COLOR: Signs for state parks shall have a white legend and border on a brown background.

CONT.

DRAMA SIGNS:

At some state parks, drama presentations have become major tourist attractions. Therefore, signs pertaining to these events may be installed on the state park signs. The sign messages shall be simple and non-advertising in nature. The district shall be responsible for ensuring that the signs are displayed only during the dates the dramas are presented or that the signs include the dates for the presentations.

MOTORIST SYMBOL SIGNS:

The following Motorists Services symbols (RM series) may be incorporated into state park sign assemblies:

- Ø Camping
- Ø Food
- Ø Lodging

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TRAFFIC OPERATIONS

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GUIDE SIGNS

Subject

Cultural & Recreational Guide Signs

TYPES OF ACTIVITIES: Recreational or cultural interest areas are attractions or traffic generators that are open to the general public for the purpose of play, amusement, or relaxation. In addition to cultural and recreational activities, these areas include historical, agricultural, educational, or entertainment activities.

INSTALLATION: Through the permit process, the Cabinet allows the installation and maintenance of Cultural and Recreational Guide signs within the right of way of conventional highways.

603 Kentucky Administrative Regulation (KAR) 4:045 sets forth the criteria to be followed in the installation and maintenance of these signs. These signs shall not be erected until activities are approved by the Transportation-Tourism Interagency Committee in accordance with 603 KAR 4:045.

COLOR: Cultural and Recreational Guide signs shall have a white legend and border on a brown background.

INSTALLATION: The applicant shall be responsible for the cost of the fabrication and installation of these signs. Applicants may use the statewide contractor for Cultural and Recreational Guide signs to install these signs. If the statewide contractor is used, payment shall be made prior to the Cabinet's releasing a work order to the statewide contractor for the installation of these signs.

MAINTENANCE: Maintenance of these signs shall be the responsibility of the applicant.

CONTACT: Questions regarding Cultural and Recreational Guide sign issues should be forwarded to the division.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

511 Signs

BACKGROUND: Kentucky's 511 program is an automated traffic, travel, and weather information service. The 511 telephone service is part of a nationwide program where motorists who wish to obtain traffic and transportation information can do so by dialing 511 in areas where the service is available. In Kentucky, the system has been modified to provide tourism information in areas where tourism is promoted by the Southern and Eastern Kentucky Tourism Association (SEKTA).

LOCATIONS: The district shall install and maintain 511 signs on interstates, parkways, and major state highways to inform motorists of this service.

COLOR: These signs have a white legend and border on a blue background.

LEGENDS: The three possible 511 messages are:

- Ø 511/TRAFFIC AND/TRAVEL INFO/DIAL 511—These signs shall be installed on highways that are part of the CARS-511 System.
- Ø 511/TRAFFIC AND/TOURISM INFO/DIAL 511—These signs shall be installed on highways that are part of the CARS-511 System and are served by the SEKTA.
- Ø 511/(blank line)/TOURISM INFO/DIAL 511—These signs shall be installed on certain highways that are not part of the CARS-511 System and are served by SEKTA.

INSTALLATION PROCEDURES: The following procedure should be followed when installing these signs:

1. The division shall determine the legends and approximate locations.
2. Signs should be installed behind guardrail if possible. If this is not possible, the district should exercise judgment to find a convenient and safe location for the sign installations.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Hydrant Location Signs

BACKGROUND: Rapid location of fire hydrants can be hindered by high fills, noise walls, fencing, and shrubbery or trees blocking the view from fire apparatus on the traveled way. Hydrant Location signs are not traffic control devices but aid fire officials in locating fire hydrants. Uniformity in application is essential for locating purposes and to ensure they do not distract from official traffic control devices.

INSTALLATION & MAINTENANCE RESPONSIBILITY: The fabrication, installation, and maintenance of the signs shall be the responsibility of the local governmental agency or other entity seeking approval for installation. These signs shall be installed via the permitting process.

PERMIT PROCESS: Permit applications shall contain a plan for the installation of the signs including the number of signs, their locations, and locations of the adjacent hydrants. All applications for such signing shall be submitted to the division for review and comment.

INSTALLATION CRITERIA: Signs should be installed in accordance with the following criteria:

- Ø Fire hydrants within 300 feet of the traveled way may be marked.
- Ø White-on-blue 8-inch x 8-inch signs with a hydrant symbol shall be used.
- Ø Signs should be placed back to back.
- Ø Signs shall be installed only on the side of the roadway where the hydrant is located.
- Ø Signs shall not be installed farther than 30 feet from the edge of pavement.
- Ø Signs shall be placed on the right-hand wall facing traffic on elevated structures.
- Ø Signs may be installed on fence or sound walls.

CONT.

MARKINGS/ DELINEATORS: **Chapter TO-507** of this manual includes guidance on the use of pavement markings and delineators to identify fire hydrant locations.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Historical Highway Markers

MARKER PROGRAM: The Kentucky Historical Highway Marker Program is administered by the Kentucky Historical Society in cooperation with the Cabinet. The program commemorates historic sites, events, and personalities throughout the Commonwealth.

INSTALLATION: District forces shall install historical markers on or near public roadways. Requests for the district to install these markers come from the Kentucky Historical Society through a coordinated effort with their chairman for the particular county.

LOCATIONS: General locations and inscriptions for markers are approved by the historical society in conjunction with its county chairman. However, the final decision for placement of a marker on public highways rests with the Cabinet.

No marker shall be erected where it will create a traffic hazard or in any location not agreeable to the property owner or the governmental agency having jurisdiction.

INSTALLATION PROCEDURE: The district shall install historical highway markers in accordance with the procedure outlined below:

1. The district will be contacted by the manager of the Kentucky Historical Highway Marker Program when the marker is ready and will be given the name of the person to contact concerning the location of the marker.

2. The marker will be provided by the historical society and shipped to the district directly from the marker manufacturer.

3. The manager of the Kentucky Historical Highway Marker Program will send a copy of the proposed text to the district for verification of the text on the marker.

CONT.

INSTALLATION PROCEDURE (cont.):

4. The manager of the Kentucky Historical Highway Marker Program will inform the district of the date of the dedication ceremony.

5. The district shall coordinate the installation of the marker in advance of the scheduled dedication ceremony.

MAINTENANCE PROCEDURE:

The district shall participate in the maintenance of historical markers according to the following procedure:

1. If the activities associated with a nearby construction project may potentially damage an existing historical marker, the district should remove the marker for storage until the project is completed. In such cases, the district shall contact the manager of the Kentucky Highway Marker Program regarding the temporary removal of the marker. The manager of the Kentucky Highway Marker Program shall also be notified of the reinstallation date of the marker.

2. Damaged markers shall be reported to the manager of the Kentucky Historical Highway Marker Program.

3. No attempt should ever be made to polish or paint an existing marker.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Permanent Temporary Detour Signs

BACKGROUND: In times of emergency, a need may exist to guide road users away from and around high-risk incidents on or near the traveled way.

PROCEDURE: "Temporary detour" signing may be installed on a permanent basis on highways that would serve as detour routes for limited-access multi-lane facilities and on facilities covered by freeway service patrols.

Local governmental agencies desiring to install permanent detour signs shall obtain approval from the district through the permitting process. The application shall contain a plan for the installation of the signs, including the number of signs and their location. Nothing in this section shall prohibit the Cabinet from installing and maintaining "temporary detour" signage.

LOCATIONS: Permanent "temporary detour" signing should be installed on the right-hand side of the roadway facing traffic. Where conditions prevent the installation of permanent "temporary detour" signs on the right-hand side of the roadway, they may be installed on the left-hand side of the road.

LEGACY SYSTEMS: For legacy systems, existing signs shall be used.

INSTALLATION & MAINTENANCE RESPONSIBILITY: The fabrication, installation, and maintenance of the signs shall be the responsibility of the local governmental agency seeking approval for installation unless the Cabinet has installed the signs.

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TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Interchange Guide Signs

APPROVAL: Destinations on interchange guide signs shall be approved by the division.

NON-FREEWAY INTERCHANGES: Interchanges on highways other than interstates and parkways should be signed as expressways in accordance with Section 2E of the *Manual on Uniform Traffic Control Devices*.

ROUTE MARKERS: Kentucky route markers, U.S. route markers, interstate shields, and parkway shields shall be used (if applicable) on the major sign sequence of Interchange Guide signs to denote the interchange crossroad.

ROAD NAMES: If an existing name for the road is known and space is available on the sign, it may supplement the route marker as information. Road names indicating business, shopping center, or other commercial or industrial establishments shall not be used.

In rare cases, a local road name may be used as the primary destination on the Interchange Guide signs. The most common examples include situations where the crossroad is not a state-maintained highway or where there are no qualifying communities to use as destinations.

QUALIFYING CITIES: The major sign sequence of Interchange Guide signs should include the names of incorporated cities accessible from the interchange to direct motorists to these destinations.

Only incorporated cities meeting the following criteria should be considered for the major sign sequence of Interchange Guide signs or for Supplemental Guide signs:

- The city shall be located not more than two miles per 1,000 population from the facility

CONT.

QUALIFYING CITIES (cont.):

- Ø Signs shall not be provided for cities that are located a greater distance than 25 miles from the facility

- Ø Signs shall not be provided for cities of less than 2,000 population

When more cities satisfy the above criteria than can be included on the major sign sequence, the qualifying cities must be ranked in order to determine which cities are placed on the major sign sequence.

The following procedure can be used to rank cities in order of importance:

1. County seats should receive priority over other cities. The highest-priority destination should be the county seat of the county where the interchange is located.

2. Cities shown on the official state highway map should be the next priority.

3. The ratio of the city's population to the number of miles from the interchange should be checked. Cities with ratios that are significantly higher than those of other cities should receive priority.

4. Cities significantly closer to the interchange than other cities should receive priority.

5. If appropriate destinations for the signs are still not obvious, populations of the cities should be used to determine higher-priority locations.

The highest cities on the priority list should be selected as destinations on the major sign sequence of Interchange Guide signs. Supplemental Guide signs may be considered for the highest-ranked cities not included on the major sign sequence.

In urban areas with numerous interchanges, it may be desirable to include only the route marker and corresponding road name on the major sign sequence without signing for specific communities.

In rare instances, there may be no qualifying cities at a rural interchange. In such cases, nonqualifying cities may be used as a destination on the major sign sequence in lieu of only signing for the route number of the crossing highway.

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Supplemental Guide Signs

NUMBER OF SIGNS: No more than two Supplemental Guide signs shall be installed on the approach to an interchange. Two signs shall be permitted only if there is physical space, in accordance with spacing criteria in the *Manual on Uniform Traffic Control Devices*, on both the mainline roadway and ramp area.

NUMBER OF MESSAGES: No more than two messages shall appear on any Supplemental Guide sign without the approval of the Secretary of Transportation.

APPROVAL: All requests for white-on-green Supplemental Guide signs shall be forwarded to the division for approval.

QUALIFYING COMMUNITIES: Occasionally, it is necessary to provide motorists with additional information regarding incorporated cities accessible from an interchange other than places shown on the major sign sequence. These additional destinations may be shown on a Supplemental Guide sign.

Only incorporated cities satisfying the qualifying criteria for the major sign sequence of Interchange Guide signs should be considered for Supplemental Guide signs (see **Section TO-404-38).** Supplemental Guide signs may be considered for the highest-ranked cities not included on the major sign sequence.

COLLEGES & UNIVERSITIES: Not-for-profit colleges and universities may be used as destinations on the supplemental signs for a given interchange provided all of the following requirements are satisfied:

- Ø The college or university is recognized as an institution of higher learning by the Council on Postsecondary Education.

CONT.

COLLEGES & UNIVERSITIES (cont.):

- Ø The total enrollment for at least one reporting period (quarter, semester, etc.) of the most recent school year is at least 1,000 students. Both full- and part-time students may be considered. The enrollment figures shall be verified using the most recent information published by the Council on Postsecondary Education.
- Ø The institution is within 25 miles of the interchange where signing will be provided.

These signs shall not be installed until sufficient signs have been installed from the interchange to the school in accordance with **Section TO-404-19.**

AIRPORTS: Supplemental Guide signs for air carrier/commercial service airports may be installed at interchanges within a 15-mile radius of the airport. The message AIRPORT, airport symbol, and/or name of the airport may be included on these signs.

Adequate signing from the interchange to the airport shall be installed prior to the installation of the supplemental signs (see **Section TO-404-20).**

Supplemental Guide signs for general aviation or private airports shall not be installed at interchanges. Such signing could potentially mislead motorists who are unfamiliar with the area and looking for a commercial airport.

If an interchange is located within a 7.5-mile radius of a general aviation airport, trailblazing signs should be provided from the ramp termini to the airport (see **Section TO-404-20).**

GOVERNMENT & QUASI-GOVERNMENT FACILITIES: Supplemental Guide signs may be installed for certain government and quasi-government facilities. Refer to AASHTO's *Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways* for guidance on determining if facilities would qualify for such signing.

INDUSTRIAL PARKS: Highways that provide access to industrial parks typically have a significant percentage of truck traffic. Signs for industrial parks may improve safety on these routes by minimizing the confusion of truck drivers seeking these facilities. These signs are not meant to advertise the industrial parks and shall not be installed unless industrial developments have already moved into the park.

These signs shall not be installed until sufficient signs have been installed from the interchange to the industrial park.

CONT.

INDUSTRIAL PARKS (cont.): Typically, the name of the industrial park should not be included in the sign legend. However, the division may decide to include the name on the sign when:

- Ø Signing for an extremely large industrial park
- Ø Multiple industrial parks are located in the same area and could confuse motorists looking for a particular facility

ROAD NAMES: Roads named to indicate a business, shopping center, or other commercial or industrial establishment shall not be used as a road name on supplemental signs.

LIMITED SUPPLEMENTAL GUIDE SIGNS: Limited Supplemental Guide signs are official guide signs installed on the approaches to interchanges on interstates, parkways, and other fully controlled access highways that guide motorists to historic sites; cultural, recreational, or entertainment facilities; or areas of natural phenomenon or scenic beauty.

The Cabinet shall control the installation and maintenance of Limited Supplemental Guide signs. These signs count toward the maximum number of supplemental messages/signs allowed at interchanges.

Limited Supplemental Guide signs shall have a white legend and border on a brown background.

603 Kentucky Administrative Regulation 4:050 sets forth the procedures to be followed in the installation and maintenance of these signs. All requests for such signs shall be reviewed by the division in conjunction with the Transportation and Tourism Interagency Committee.

Limited Supplemental signs shall be installed by contract. The applicant shall participate in the cost of installing these signs, and payment shall be made prior to the Cabinet's releasing a work order to the statewide contractor for the installation of these signs.

The district shall report all damaged signs to the Division of Highway Design. All other questions regarding Limited Supplemental signs for cultural and recreational activities should be forwarded to the division.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Emergency-Service Signs at Interchanges

QUALIFYING SERVICES: The Cabinet may install and maintain emergency-service signs for the following services at interchanges on interstates and parkways:

- Ø Police
- Ø Hospitals

APPROVAL: All requests for emergency-service signs at interchanges shall be forwarded to the division for approval.

LOCATIONS: Signs for emergency services should be installed in accordance with the following criteria:

- Ø Signs should be installed only if the emergency facility is within a 10-mile radius of the interchange.
- Ø Emergency-service signs shall not be installed at major interchanges involving freeway-to-freeway connections.
- Ø Emergency facilities accessible from more than one interchange should be signed for at only one of the exits for each direction of travel. The preferred exit shall be selected by the Cabinet, giving consideration to the most direct or best access to serve the motorists' interests.

Adequate signing from the interchange ramp to the facility shall be installed prior to the installation of the signs on the interstate or parkway. The distance shall be shown on the directional signs at the ramp termini if the distance to the facility is greater than one mile. Trailblazing assemblies shall not be installed on the mainline portion of interstates or parkways because their size makes it difficult for motorists to read and comprehend the information on the sign.

POLICE SIGNS: Signs shall be installed only for state police posts. The sign layout may include the official name of the state police post.

CONT.

HOSPITAL SIGNS: Signs shall be installed only for hospitals that satisfy the following criteria:

- Ø Provide 24-hour service 7 days per week
- Ø Have emergency facilities with a physician or emergency-care nurse on duty who is trained in emergency medical procedures

The hospital name shall not be included on Hospital signs.

COLOR: Emergency-service signs shall have white letters and borders on a blue background.

DAMAGED SIGNS: The district shall report all damaged panel signs to the Division of Highway Design.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Cultural & Recreational Post-Interchange Signs

PURPOSE: Cultural and Recreational Post-Interchange signs are placed miles in advance of the interchange to give motorists notice of an upcoming attraction. This allows motorists time to decide whether to visit an attraction before they actually have to exit the roadway. These signs are considered experimental in Kentucky with approval from the FHWA.

PROCEDURES: The Cabinet shall control the installation and maintenance of Cultural and Recreational Post-Interchange signs within the right of way of fully controlled-access highways. Signs shall be installed only for activities involving a historic site or tourist area/attraction that have a Limited Supplemental sign at an interchange.

All requests for Cultural and Recreational Post-Interchange signs shall be reviewed by the division in conjunction with the Transportation and Tourism Interagency Committee. These signs shall be installed by contract. The applicant shall participate in the cost of installing these signs, and payment shall be made prior to the Cabinet's releasing a work order to the statewide contractor for the installation of these signs.

COLOR: Cultural and Recreational Post-Interchange signs shall have a white legend and border on a brown background.

LEGEND: Signs may list up to three traffic generators. The signs may list either mileage to the attraction/area or the exit number. Exit numbers are more likely to be used in urban areas. Mileage is more common in rural areas.

LOCATION: Each attraction/area may be displayed on up to two signs per approach to the interchange. The signs should be placed approximately 10 and 20 miles in advance of the interchange. Spacing may be adjusted if necessary.

CONTACTS: The district shall report all damaged signs to the Division of Highway Design. All other questions regarding Cultural and Recreational Post-Interchange signs should be forwarded to the Division of Traffic Operations.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

Specific Service (Logo) Signs

PURPOSE: Specific Service (Logo) signs inform motorists of the availability of travel-related goods and/or services and provide directional information for business establishments offering these goods and services.

PROCEDURES: The Cabinet shall permit the installation and maintenance of Logo signs for qualifying services within rights of way of fully controlled access highways.

603 Kentucky Administrative Regulation 4:035 sets forth the criteria to be followed in the installation and maintenance of these signs.

QUALIFYING SERVICES: Specific Service signs may be installed for the following types of services:

- Ø Gas
- Ø Food
- Ø Lodging
- Ø Camping
- Ø Attractions

COLOR: Logo signs shall have a blue background with a white border.

CONTACTS: All questions regarding these signs should be forwarded to the statewide Logo contractor. The contractor is responsible for the marketing, determination of eligibility, maintenance, installation, and removal of Specific Service signs. Should there be any conflicts or unresolved issues, the Permits Branch of the Division of Maintenance should be contacted.

2 2 2

TRAFFIC OPERATIONS

Section

GUIDE SIGNS

Subject

NEXT REST AREA Signs

PROCEDURES: In addition to the standard sequence of signs, a supplemental panel reading NEXT REST AREA/XX MILES shall be installed below the REST AREA advance guide sign that is closest to the exit. Such placement shall not impair the breakaway characteristics of the sign.

COLOR: This sign shall have a white legend and border on a blue background.

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TRAFFIC OPERATIONS

Chapter

GUIDE SIGNS

Subject

Alternate Truck Routes

PURPOSE: These signs provide guidance regarding alternate truck routes. The installation of these signs does not establish regulatory authority to prohibit truck traffic along a route.

PROCEDURE: The district may install signing to encourage truck traffic to use an alternate route. The following procedure shall be followed when installing such signs:

1. The local governmental entity must pass a resolution in favor of the alternate truck route designation. If the alternate truck route passes through multiple jurisdictions, resolutions shall be required from each governmental entity.

2. The district shall conduct a review of the "bypassed" route to determine the need for an alternate truck route and shall conduct a review of the proposed alternate truck route to determine if the route is acceptable from an engineering perspective.

3. If the district determines that the alternate route is necessary and acceptable from an engineering perspective, it shall submit a request to the division for the development of a signing plan. With the assistance of the district, the division shall develop and approve the signing plan for the alternate truck route.

4. The district shall install the recommended signs along the alternate route.

5. After installing the signs, the district shall notify the Division of Traffic Operations and Division of Planning of the limits of the alternate route (including milepoints) and the installation date of the signs.

2 2 2

TRAFFIC OPERATIONS

Chapter

PAVEMENT MARKINGS & DELINEATION

Subject

Introduction

OVERVIEW*:* Set forth are the requirements for pavement markings and delineation devices on the state highway system. Except as noted in this chapter, all markings and delineation devices shall conform to the *Manual on Uniform Traffic Control Devices (MUTCD)*, current adopted edition. The purpose of this chapter is to discuss any additions to or departures from the *MUTCD*.

PAVEMENT MARKINGS: Pavement markings include:

- Ø Striping (centerlines, lane lines, edge lines, and gore markings)
- Ø Intersection markings (transverse markings, symbols, and word markings)
- Ø Curb and parking-space markings
- Ø Raised pavement markers

DELINEATION DEVICES: Delineation devices include:

- Ø Post-mounted delineators
- Ø Surface-mounted delineators
- Ø Guardrail delineators
- Ø Barrier wall delineators

2 2 2

TRAFFIC OPERATIONS

Chapter

PAVEMENT MARKINGS & DELINEATION

Subject

Pavement Marking Installation & Maintenance Responsibilities

GENERAL: Providing adequate pavement markings for both daytime and nighttime use by motorists on state highways is a joint responsibility of the districts, Division of Maintenance, and Division of Traffic Operations.

DIVISION OF MAINTENANCE: The Division of Maintenance is generally responsible for the following functions:

- Ø Establishing a statewide pavement markings maintenance program and budget using FE01 and six-year highway plan funding
- Ø Developing specifications and approved lists for various pavement marking materials
- Ø Developing and maintaining a statewide policy on the selection of specific pavement marking materials for different roadway and pavement types
- Ø Establishing price contracts for the purchase of pavement marking materials for use by the districts
- Ø Preparing pavement marking contracts
- Ø Developing, coordinating, and providing training on quality control and inspection activities

DIVISION OF TRAFFIC OPERATIONS: The Division of Traffic Operations is generally responsible for the following functions:

- Ø Providing recommendations and interpretations of the *Manual on Uniform Traffic Control Devices* with regard to pavement markings
- Ø Developing and maintaining a list of roadway sections that make up the Raised Pavement Marker System **(Exhibit 9)**

CONT.

DIVISION OF TRAFFIC OPERATIONS (cont.):

- Ø Establishing a statewide raised-pavement-marker program and budget using six-year highway plan funding
- Ø Preparing raised pavement marker contracts for new casting installations and lens replacement
- Ø Reviewing new and innovative pavement marking products and concepts
- Ø Coordinating experimental projects and research involving pavement markings

DISTRICT: Each district is generally responsible for the following functions:

- Ø Developing a comprehensive striping program for its district
- Ø Utilizing state crews or contract forces to install and maintain pavement markings
- Ø Providing eligible sections of roadway, typical sections, estimated quantities, and other required information for inclusion in projects prepared by the Central Office
- Ø Conducting adequate inspections and condition assessment of the pavement markings in its district
- Ø Providing advice and reviewing striping plans as part of the preconstruction process
- Ø Providing advice and assistance with the layout of pavement markings on construction and resurfacing projects

TRAFFIC OPERATIONS

Chapter

PAVEMENT MARKINGS & DELINEATION

Subject

Striping

GENERAL: Normal lines on all state highways shall be four inches in width unless otherwise noted in this chapter. Normal lines on interstates and parkways shall be six inches in width. Six-inch lines may be installed on roadways other than interstates and parkways with approval of the State Highway Engineer.

Mainline striping should be broken for intersections of public roadways and major commercial entrances. Mainline striping should not be broken for driveways or minor commercial entrances.

CENTERLINES: Centerline striping shall be installed on all state highways where the following two conditions are satisfied:

- Minimum width of 18 feet (excluding the shoulder)
- Average daily traffic (ADT) of 300 vehicles per day or greater

At the discretion of the district, centerline striping may also be installed on other state highways that are at least 16 feet in width. Roadways that are less than 16 feet wide shall not be striped with a centerline.

NO-PASSING ZONE MARKINGS: No-passing zone markings should be established as outlined in the *Manual on Uniform Traffic Control Devices* (*MUTCD)* based on the minimum passing sight distance for the posted speed limit. If adequate passing sight distance is available, passing should be permitted in school zones, on full-width bridges, through small communities, on downtown streets, and in the downhill portion of truck-climbing lanes. However, no-passing zone markings may be installed at any location where an engineering study indicates that passing should be prohibited.

Successive no-passing zones should be connected if the distance between them is 400 feet or less. On low-volume roads with low speeds and infrequent passing opportunities, the minimum distance between successive no-passing zones may be shortened to 200 feet.

CONT.

NO-PASSING ZONE MARKINGS (cont.): No-passing zone markings should be installed on the approaches to all intersections with public roads and major commercial entrances if the ADT of the crossroad is 400 vehicles per day or greater. If traffic counts for the crossroad are not available, the ADT may be estimated using engineering judgment. The length of a no-passing zone installed on the approach to an intersection should be a minimum of 500 feet. If adequate sight distance is available, the pavement should be marked to indicate passing is allowed immediately following the intersection.

EDGE LINE STRIPING: Edge line striping shall be installed on all state highways where the following conditions are satisfied:

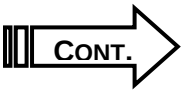
- ADTs greater than 3,000 vehicles per day
- Minimum roadway width of 20 feet on 2-lane roadways (excluding the shoulder)
- Minimum driving lane width of 10 feet on multi-lane roadways

At the discretion of the district, edge line striping may be installed on roadways with ADTs of less than 3,000 vehicles per day, based on engineering judgment, provided they meet the pavement width requirements listed above.

Edge line striping may be excluded, based on engineering judgment, in areas where the edge of the pavement is delineated by physical objects such as curbs, parking spaces, or other markings. Edge line striping should be installed on roadways with curb and gutter typical sections when the posted speed limit is 45 mph or greater.

At the district's discretion, roadways at least 16 feet wide but less than 20 feet wide may receive edge lines instead of a centerline if an engineering study indicates it is more important to mark the edge of the roadway than the center. Roadways less than 16 feet wide may receive edge lines instead of being unmarked if an engineering study indicates the need for edge line striping. Following are conditions that may indicate the need for edge line striping in such cases:

- Greater potential for run-off-roadway crashes versus head-on and side-swipe crashes
- Low-volume roadway
- High percentage of local traffic
- Severe drop-offs near the pavement edge
- Significant and routine occurrence of fog or other adverse weather conditions



EDGE LINE STRIPING (cont.): Intersections with 100:13 right-turn tapers should be striped as shown in **Exhibit 7.** Existing locations with striping that does not conform to the exhibit shall be modified if the crash history indicates a need to do so.

GORE & INTERCHANGE MARKINGS: Gore markings at interchanges with tapered ramps should be striped in conformance with Standard Drawing TPM-130. Gore markings at interchanges with parallel ramps should be striped in conformance with Standard Drawing TPM-135. Other types of interchanges or those with unusual geometry should be striped using similar principles to those shown in the Standard Drawings (TPM-130 and TPM-135) and the *MUTCD*.

Chevron markings in the neutral area should not be used in most instances. They may be used if there is a specific need to provide additional guidance to motorists.

Dotted extensions of the lane line or the right edge line should not be used in most instances. They may be used if there is a specific need to provide additional guidance to motorists.

Lane reduction arrow markings should not be used in most instances. They may be used if there is a specific need to provide additional guidance to motorists. If used, they should be installed in conformance with **Exhibit 6.**

TRUCK-CLIMBING LANES: Striping for truck-climbing lanes is shown in **Exhibit 5.**

LANE TRANSITIONS: Striping for lane transitions is shown in **Exhibit 6.**

TRAFFIC OPERATIONS

Chapter

PAVEMENT MARKINGS & DELINEATION

Subject

Intersection, Symbol, & Word Markings

GENERAL: **Exhibit 8** shows typical uses of intersection markings for signalized intersections. Some aspects of this drawing may also apply to non-signalized intersections.

STOP LINES: Stop lines shall be used to mark the desired stopping location on all approaches to traffic signals. Stop lines may be used on approaches to intersections controlled by a stop sign. Stop lines shall not be used for yield conditions or in a left-turn lane on an uncontrolled intersection approach.

SYMBOLS: The policy for symbols is as follows:

- Ø Turn arrows shall be used in all turn lanes at signalized intersections.
- Ø Turn arrows should be used in the turn lanes of the crossroad at all interchanges.
- Ø Turn arrows should be used at the ends of off-ramps with two or more lanes to discourage wrong-way entry.
- Ø For single-lane ramps, either a combination right/left turn arrow located at the end of the ramp or wrong-way arrows located as shown in the *Manual on Uniform Traffic Control Devices (MUTCD)* may be used.
- Ø Turn arrows may be used at other locations at the discretion of the district.
- Ø Turn arrows and the word marking ONLY shall be used in all through lanes that become mandatory turn lanes.

WORD MARKINGS: Due to the cost associated with the installation and maintenance of word markings, their use should be limited to locations with a demonstrated need for additional guidance to the motorist or as otherwise discussed in this chapter. Approved word messages for use on state highways include ONLY, STOP, STOP AHEAD, YIELD, YIELD AHEAD, and R X R. Other word markings shall not be used without approval from the division.

CONT.

BICYCLE LANE MARKINGS:

Information on bicycle lane markings is provided in the *MUTCD* and AASHTO's *Guide for Development of Bicycle Facilities*.

Where bicycle lane symbol markings are used, they shall be the symbol that shows a person wearing a helmet riding a bicycle.

RAILROAD PAVEMENT MARKINGS:

Railroad pavement markings shall be installed in advance of all highway-rail grade crossings where the posted speed limit is 40 mph or greater. Markings should be installed in advance of all other highway-rail grade crossings unless an engineering study indicates that other installed devices provide suitable warning and control.

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TRAFFIC OPERATIONS

Chapter

PAVEMENT MARKINGS & DELINEATION

Subject

Curb & Parking Space Markings

RESPONSIBILITIES OF CITY: On state highways located within a city, the installation and maintenance of all curb and parking-space markings and parking meters and the establishment of time and usage restrictions for parking spaces are the responsibility of the local government. These responsibilities are outlined in KRS 189.390 and the Traffic Control Agreement with the city.

RESPONSIBILITIES OF CABINET: On newly constructed or resurfaced roadways, the Cabinet reserves the right to review and approve the proposed parking plan. In order to establish proper parking control, the Cabinet may choose to install the initial curb and parking-space markings at the Cabinet's expense. In such cases, future maintenance of those markings becomes the responsibility of the local government.

In all cases, the Cabinet maintains the authority to prohibit parking in areas where safety and traffic flow could be compromised. In cases where the Cabinet requests the local government to remove or modify parking and the local government refuses, the Cabinet may undertake the necessary changes and bill the local government for the costs associated with the changes.

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TRAFFIC OPERATIONS

Chapter

PAVEMENT MARKINGS & DELINEATION

Subject

Raised Pavement Markers

LOCATIONS: Type V (metal, snowplowable) raised pavement markers (RPMs) shall be installed on all sections of roadway that are identified in the Raised Pavement Marker System (see **Exhibit 9).** RPMs shall also be installed on sections of road with a two-way left turn lane (TWLTL). RPMs shall not be installed on bridge decks. Spacing, colors, and arrangement of RPMs shall conform to the Cabinet's Standard Drawings for permanently installed pavement markers.

CONTRACTS: It is the responsibility of the Division of Traffic Operations to prepare contracts for the installation of raised pavement marker castings as well as the replacement of reflective lenses in existing raised pavement marker castings. These contracts will typically be prepared on an annual basis depending on available funding and other needs.

DISTRICT RESPONSIBILITY: It is the responsibility of the district to identify those sections of roadway in need of RPMs or lens replacements due to resurfacing projects, new construction, or a condition assessment of existing RPMs and lenses. If requested, the district shall provide the following information for each section of roadway submitted for inclusion in a contract:

- Ø Typical sections
- Ø Number and average length of turn lanes
- Ø Number and average length of entrance/exit ramps
- Ø Number of gore areas
- Ø Other information required for estimating purposes

HIGHWAY PROJECTS: RPMs may also be installed as part of roadway construction or resurfacing projects prepared by the Division of Highway Design or Division of Maintenance. However, the project must be on a roadway that is included on the Raised Pavement Marker System or a section of roadway that has a TWLTL.

2 2 2

TRAFFIC OPERATIONS

Chapter

PAVEMENT MARKINGS & DELINEATION

Subject

Pavement Markings for Fire Hydrants

BACKGROUND: Rapid location of fire hydrants can be hindered by high fills, noise walls, fencing, and shrubbery or trees blocking the view from fire apparatus on the traveled way. Pavement markings may be used to mark hydrant locations to aid fire officials in locating fire hydrants. Uniformity in application within the fire jurisdiction is essential for locating purposes and ensuring they do not distract from official traffic control devices.

APPROVED MARKINGS: Examples of acceptable pavement markings for this usage include:

- Ø Raised pavement marker with a blue lens
- Ø Blue rectangle made of thermoplastic or other suitable pavement marking material

INSTALLATION: These markings shall be installed by local governmental agencies through the encroachment permit process. Permit applications shall contain a plan for the installation of the markings including the number of markings, the proposed location on the roadway, the location of the adjacent hydrants, and the type of material to be used. Installation and maintenance shall be the sole responsibility of the local governmental agency seeking approval for installation.

SIGNS: The use of hydrant location signs to accomplish a similar purpose is included in **Section TO-404-35** of this manual.

2 2 2

TRAFFIC OPERATIONS

Chapter

PAVEMENT MARKINGS & DELINEATION

Subject

Delineation Devices

PURPOSE: Delineators are used to indicate the alignment of the roadway. They are considered a guidance device rather than a warning device.

LOCATION: Delineators may be used on curves and ramps of freeways and expressways at the discretion of the district. They may be excluded on tangent sections provided there are raised pavement markers in place.

Delineators shall be used to mark all median crossovers on divided highways. The delineator shall be located to mark the far side of the opening for each direction of traffic.

POST-MOUNTED DELINEATORS: When post-mounted delineators are installed, flexible delineator posts shall be used instead of metal posts. Existing lightweight metal post-mounted delineators may remain in use until replaced by attrition.

SURFACE-MOUNTED DELINEATORS: Surface-mounted delineators may be used, at the discretion of the district, to mark the ends of raised islands and medians to improve visibility for turning traffic.

GUARDRAIL DELINEATORS: At the discretion of the district, guardrail delineators may be used to indicate the alignment of the roadway or to indicate openings in the guardrail at entrances. Guardrail delineators should be used on all guardrail sections located in the median.

BARRIER-WALL DELINEATORS: Barrier-wall delineators shall be used on all sections of roadway with concrete barrier wall in the median. Delineator placement and spacing are shown in the *Kentucky Department of Highways' Standard Drawings*. The Division of Traffic Operations may approve additional barrier-wall delineation systems for use.

2 2 2

TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

General

OVERVIEW: Set forth are the requirements for traffic control electrical devices on the state roadway system. Except as noted elsewhere in this chapter, traffic control electrical devices shall conform to the *Manual on Uniform Traffic Control Devices (MUTCD)*, current adopted edition. The purpose of this chapter is to discuss any additions to or departures from the *MUTCD*.

DEFINITION: Traffic control electrical devices are defined as electronic devices that assign right of way at intersections or warn motorists to take a specific action through the use of traffic signal heads. These devices include, but are not limited to, traffic signals, flashing beacons, and school flashers.

PURPOSE: The purpose of this chapter is to define guidelines under which the Cabinet approves, designs, installs, operates, and maintains traffic control electrical devices on state highways.

2 2 2

TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

Approval

APPROVAL AUTHORITY: Traffic control electrical devices shall be installed or removed only with the written approval of the Deputy State Highway Engineer for System Preservation and Operations or his or her superior (refer to **Section TO-203).**

APPROVAL PROCESS: The various levels of the approval process for the installation or removal of traffic control electrical devices are outlined below:

Ø LEVEL 1:

1. Initial requests for traffic control electrical devices shall be evaluated by the district. This evaluation should include a thorough review of engineering data and a comprehensive study of the traffic conditions and characteristics of the location as outlined in this chapter as well as in the *Manual on Uniform Traffic Control Devices*.

2. At any point during the review process, the district may exercise engineering judgment and deny the request if it is apparent that a traffic signal is not warranted.

3. If the district determines the request should be reviewed further, district personnel shall submit a written request to the division including the district's recommendation and all supporting information.

Ø LEVEL 2:

1. The division shall review the submitted request. If the division denies the request, it shall send a formal response to the district stating the basis for the denial.

CONT.

APPROVAL PROCESS (cont.):

2. If the division recommends approval of the request, the district will be advised, if necessary, to seek local input concerning the installation of the device as well as subsequent payment of the resultant power bill, if applicable. Once local input is received and submitted to the division, a recommendation for approval, based upon a review of all pertinent information, shall be made to the Deputy State Highway Engineer for System Preservation and Operations.

Ø LEVEL 3:

1. If approval is granted, the division shall submit a Traffic Signal Checklist **(Exhibit 10)** to the district with notification of approval.

2. If approval is not granted, the division shall notify the district of the decision.

PROJECT DEVELOPMENT PROCESS:

The approval process listed above shall also be followed for new electrical devices on design projects (see **Chapter HD-902** of the *Highway Design Policy Manual* for additional information). The district should attend project team meetings and assist the project manager with assembling the appropriate data as outlined in the following sections.

REQUIRED DATA FOR TRAFFIC SIGNAL REQUESTS:

All requests for traffic signals submitted to the division for review shall include the following documentation:

Ø Count data that includes hourly totals for each movement. For proposed signals on projects, construction year traffic forecasts may be used in lieu of count data. For additional guidance on permitted signals, see **Chapter TO-608** of this manual.

Ø A Traffic Signal Warrant Analysis **(Exhibit 11)** or equivalent form for traffic projections. All fields must be completed.

Ø Crash diagram or written summary of crashes. Any documentation of the crash history at an intersection should involve reviewing the crash reports and eliminating any unrelated collisions from the diagram or summary.

CONT.

REQUIRED DATA FOR SCHOOL FLASHER REQUESTS:

All requests for school flashers submitted to the division for review shall include the following documentation:

- Ø Verification that the school qualifies for school flashers under current policy (see **Section TO-402-5)**
- Ø Completed School Flasher Form **(Exhibit 12)**
- Ø Description of proposed school speed zone including milepoints

REQUIRED DATA FOR OTHER DEVICE REQUESTS:

All requests for other traffic control electrical devices submitted to the division for review shall include the following documentation:

- Ø Crash diagram or written summary of crashes (any documentation of the crash history at an intersection should involve reviewing the crash reports and eliminating any unrelated collisions from the diagram or summary)
- Ø Condition diagram showing existing traffic control devices

APPEAL PROCESS:

All appeals shall be submitted to the next level of authority. For example, if the district denies a traffic signal request, the next level of appeal is the division. If the division denies a traffic signal request, the next level of appeal is the Deputy State Highway Engineer for System Preservation and Operations.

2 2 2

TRAFFIC OPERATIONS

Section

OPERATIONAL DESIGN

Subject

Phasing

INITIAL TRAFFIC SIGNAL PHASING: Initial phasing of new traffic signals shall be determined at the time the signal is approved for installation. After consultation with the district, the division shall provide the approved phasing in the form of a Traffic Signal Checklist **(Exhibit 10).** Signal phasing will be based upon the data collected and submitted with the signal request.

A General Phasing Diagram is shown in **Exhibit 13.** Phase 2 should be the phase designated for mainline through traffic on either the northbound or eastbound approach. In addition, phase 4 should be the phase designated for side-street through traffic entering the intersection to the right of the phase 2 movement.

PHASING MODIFICATIONS: When traffic conditions indicate that changes are needed in the existing signal phasing, such changes shall be made only with written approval from the division. The request from the district should include a recommendation with supporting data from the guidelines listed below.

LEFT-TURN PHASING: The installation of left-turn phasing should be considered a two-step process. First, it should be determined if a left-turn phase is warranted. Second, if a left-turn phase is warranted, it should be determined whether protected-only or protected-permitted phasing should be used.

On approaches with dual left-turn lanes, protected-only left-turn phasing shall be installed for this movement. If dual left-turn lanes are constructed with a project but engineering judgment indicates that one lane with protected-permitted phasing would be more efficient, one of the two left-turn lanes should be striped out until traffic volumes warrant dual left-turn lanes.

CONT.

LEFT-TURN PHASING (cont.): The following should be used as guidelines when considering the addition of separate left-turn phasing:

- Ø Crash history includes four or more left-turn crashes in one year, six or more left-turn crashes in two years, or eight or more left-turn crashes in three years
- Ø The cross product of left-turning and opposing volumes during the peak hour exceeds 100,000 on a four-lane highway or 50,000 on a two-lane highway
- Ø Left-turn delay equals 2.0 vehicle-hours or more during the peak hour on the critical approach, with the average delay of left-turn vehicles being a minimum of 35 seconds
- Ø Sight distance is insufficient based on engineering judgment. Sight distance obstructions caused by vehicles in opposing left-turn lanes are not typically considered inadequate sight distance.

If left-turn phasing is determined to be warranted, protected-only phasing shall be used on all approaches where any one of the following conditions exists:

- Ø Left-turn movement must cross three or more opposing lanes
- Ø Traffic can turn from more than one lane on the same approach
- Ø Sight distance is insufficient based on engineering judgment. Sight distance obstructions caused by vehicles in opposing left-turn lanes are not typically considered inadequate sight distance.

Protected-permitted left-turn phasing may be used at all other locations that warrant left-turn phasing.

SPLIT PHASING: It is desirable to minimize phasing at all intersections. However, split phasing of a traffic signal may be considered at intersections when:

- Ø Intersection geometry necessitates such phasing
- Ø Intersection capacity would improve with such phasing
- Ø Railroad preemption requires it
- Ø Requirements for left-turn phasing have been met, but lane use prohibits separate left-turn lanes

CONT.

ALTERNATE/ VARIABLE PHASING:

Alternate and variable phasing, such as changing lead/lag by time of day, should be considered on a case-by-case basis. As with all phasing modifications, such phasing shall be approved by the division.

LEFT-TURN TRAPS:

A left-turn (or yellow) trap is a safety concern that can lead a left-turning driver into the intersection when it is potentially unsafe to do so. A left-turn trap can occur when a driver enters an intersection on a permitted green and waits to make a left turn until a sufficient gap occurs in the opposing traffic stream. If there are no acceptable gaps in the opposing traffic stream, the driver may be forced to complete the turn during the left-turn clearance interval and may incorrectly presume that the opposing through traffic is being stopped at the same time that the adjacent through movement is being terminated. As a result, the driver may complete the turn assuming that opposing vehicles are slowing to a stop when in fact the opposing vehicles are proceeding into the intersection with a green ball signal indication.

To avoid the possibility of a left-turn trap occurring, the left-turn type setting shall be adjusted at all signalized intersections where a left-turn trap may occur. While a left-turn type setting of (2) is normally the preferred method of addressing potential left-turn traps, a left-turn type setting of (1) may be used at the district's discretion. With a setting of (2), the signal controller will not serve the left-turn phase until the cross street is served. With a setting of (1), the signal controller puts a false call on the cross-street phase when a demand is placed on the left-turn phase. The left-turn phase will then be served at the end of the cross-street phase.

Some common examples of situations where left-turn traps are not an issue and where the left-turn type setting does not have be adjusted include the following:

- Ø Opposing left-turn movements are protected-only
- Ø Opposing left-turn movements are prohibited or do not exist (i.e., T-intersection, one-way street, etc.)
- Ø Protected-permitted phasing is installed only on the side street approaches provided that the mainline phases are operated in the recall mode

The division should be contacted in cases where the district is unsure whether a left-turn trap exists at a signalized intersection.

CONT.

RIGHT-TURN OVERLAPS:

A right-turn overlap is defined as a protected right-turn movement from a dedicated right-turn lane during a complementary protected left-turn movement on the intersecting street.

Right-turn overlaps shall not be used on approaches that do not have a dedicated right-turn lane.

When a right-turn overlap is used on a multi-lane highway, a NO U-TURN (R3-4) sign shall be installed in accordance with **Section TO-402-3.**

FLASHING OPERATION:

Flashing operation of traffic signals may be used for the following:

- Prior to placing the signal in stop-and-go operation
- As an interim measure prior to removal of the signal
- Default operation during mechanical failure
- Unique situations (such as emergencies, special events, etc.)

During flashing operation, red/yellow or all-red indications may be used.

2 2 2

TRAFFIC OPERATIONS

Section

OPERATIONAL DESIGN

Subject

Timing

RESPONSIBILITY: The district shall establish signal timing considering both safety and capacity. Periodic review of signal timing should be made to ensure effective operation. The division is available for consultation on signal timing for individual traffic signals or for coordinated traffic signal systems.

CLEARANCE INTERVALS: Yellow and red clearance intervals obtained through the following methods are suggested values and may be modified based on engineering judgment.

Yellow clearance intervals warn traffic of an impending change in the right-of-way assignment. The calculation of yellow clearance intervals should be based on the following equation:

$$y = t_r + \frac{v}{2a + 64.4g}$$

Where:

y = yellow clearance (sec)
t_r = perception/reaction time (set at 1.0 sec)
v = speed (feet/sec)
a = deceleration rate (set at 10.0 feet/sec^2)
g = approach grade (percent divided by 100, downhill is negative)

Values obtained from the equation shall be rounded up to the nearest tenth of a second. Yellow clearance intervals should normally be between 3.5 and 5.0 seconds. However, yellow clearance intervals as low as 3.0 seconds and as high as 6.0 seconds may be used based on engineering judgment.

At their discretion, districts may establish standard yellow clearance intervals for their intersections based on a typical grade for their area, rather than calculating individual yellow clearance intervals for each intersection. Clearance intervals established using this method should still vary depending on approach speeds.

CONT.

Yellow change intervals shall be followed by a red clearance interval to increase the likelihood that vehicles clear the intersection before another vehicle enters the conflict zone. The calculation of red clearance intervals should be based on the following equation:

$$r = \frac{w}{v}$$

Where:

r = red clearance interval (seconds)
w= clearance distance (feet)
v = speed (feet/sec)

Clearance distances should be rounded up to the nearest five feet. Clearance distances should be measured from the approach stop bar to the far side of the intersection or far side of the crosswalk (if present). Clearance distances for left-turn movements should be measured along a straight line as opposed to an arc. Further guidance on measuring intersection clearance distances is included in **Exhibit 22**.

Values obtained from the equation shall be rounded up to the nearest tenth of a second. Red clearance intervals should normally be between 1.0 and 3.0 seconds. However, some situations (such as offset intersections, single point interchanges, etc.) may require red clearance intervals longer than 3.0 seconds based on engineering judgment.

A table of suggested clearance intervals for common speeds, grades, and intersection widths is included in **Exhibit 23**. While clearance intervals should normally be calculated using the posted speed limit, the District may elect to use 85th percentile speeds as the basis for clearance timing.

For left-turn phases, yellow clearance intervals should be 3.5 seconds. Red clearance intervals for left-turn phasing should be calculated using a speed of 20 MPH.

For a shared clearance phase (when a phase serves multiple movements needing different clearance intervals), the following procedure should be applied:

1. Calculate each movement's clearance interval as if it had a dedicated phase.

2. Use the largest calculated yellow clearance interval.

3. Subtract this value from the largest total clearance time to determine the red clearance.

CONT.

CYCLE LENGTH & SPLITS:

Cycle lengths at isolated signals should typically be in the range of 50 to 120 seconds. Multiple-phase signals would normally have higher cycle lengths. System cycle lengths may be as long as 180 seconds in certain situations.

With the exception of Green Extension Systems (GES) and Advance Warning Flashers (AWF), the duration of each green interval generally should be set in proportion to the volume per lane for each phase. Both vehicular and pedestrian minimums should be considered. In general, the mainline split should be two-thirds of the total cycle length. That is, the mainline greens and clearances and the mainline left-turn greens and clearances should total to about two-thirds of the total cycle length. The remaining split would be for the side-street phases.

Various resources such as the *Highway Capacity Manual*, materials from the Northwestern University Traffic Institute, and computer programs are available to determine minimum green times and cycle lengths.

DELAY FOR SIDE STREETS:

In order to prevent a traffic signal from changing the instant a vehicle is detected on the side street, a minimum delay of 10 seconds should be used for all side-street approaches unless a particular circumstance would indicate otherwise.

For locations in which the mainline has a left-turn phase, any delay placed on the side street must be matched with the same delay for the mainline left-turn phase. This will prevent the mainline left-turn phase from being actuated during the side-street delay, causing the side street to have to wait for another mainline green phase following the left-turn phase.

Minimum delay should not be used for traffic signals operating within a coordinated plan.

TRAFFIC OPERATIONS

Section

OPERATIONAL DESIGN

Subject

Pedestrian Accommodations

JUSTIFICATION: Traffic signals should be equipped to accommodate pedestrians when there is known pedestrian activity at an intersection or the Cabinet has been put on objective notice that there will be occasional pedestrian movements.

Objective notice includes, but is not limited to, the following:

- Ø A known pedestrian source within close proximity of a known pedestrian generator (examples include an apartment complex within walking distance of a shopping mall or a school that is separated by a signalized intersection)
- Ø The presence of clear objective evidence such as sidewalks in the area adjacent to a signalized intersection
- Ø Requests from local-government officials or citizen groups
- Ø A demonstrated accident pattern involving vehicles and pedestrians that could be addressed with the installation of pedestrian signals

Pedestrian accommodations should not be provided at locations where the roadway is designed in such a manner that it will not safely accommodate pedestrian movements or where the signal operation does not allow for reasonable pedestrian accommodation. Examples include intersection geometry or capacity problems associated with split-phasing or signal system operation. In cases where pedestrian accommodations are needed but cannot be provided, the Cabinet should make a reasonable attempt to modify the intersection or signal operation. If this cannot be accomplished, pedestrian traffic should be addressed in some other manner or discouraged from crossing at that particular location.

DESIGN: With the exception of fixed-time signal operation or where pedestrian movements are on recall, both pedestrian indications and pushbuttons shall be installed. Existing locations that do not conform to this provision should be brought into conformance at the first opportunity or when the signal is reconstructed.

CONT.

ACCESSIBLE / AUDIBLE PEDESTRIAN EQUIPMENT:

Accessible pedestrian signals should be installed based on an engineering study that considers the installation factors stated in the *Manual on Uniform Traffic Control Devices (MUTCD)* and when the following two conditions are met:

- Ø There is sufficient demand for accessible pedestrian signals (this may include one individual who routinely uses the signal or several individuals who occasionally use the signal).
- Ø An orientation and mobility specialist with the Kentucky Department for the Blind has reviewed the location and has deemed accessible pedestrian signals necessary.

In addition to the requirements of the *MUTCD*, accessible pedestrian signals should include:

- Ø Verbal messages including “Walk Sign” and the name of the street to be crossed (if necessary)
- Ø Vibrotactile arrows on the pushbutton to indicate which crosswalk is actuated by the pushbutton (if pedestrian signals are actuated)

A pushbutton locator tone is a repeating sound that enables visually impaired pedestrians to locate the pushbutton. The use of pushbutton locator tones can be beneficial to the visually impaired; however, the sound of the locator tone may be disruptive in residential areas. Therefore, the needs of both the pedestrian and the community should be considered before utilizing pushbutton locator tones.

All new requests for accessible pedestrian signals shall be sent to the division for review and approval. Each request should include the following:

- Ø A traffic count, including volumes of turns-on-red, conducted during times when pedestrians might be present
- Ø A diagram of the intersection
- Ø A description of the signal phasing

Once the request with all supporting documentation is received, the division will contact the appropriate orientation and mobility specialist for review and input.

The division will provide the district with all necessary equipment and any technical or installation assistance.

TRAFFIC OPERATIONS

Section

OPERATIONAL DESIGN

Subject

Green Extension System (GES)

PURPOSE: A green extension system (GES) is designed to detect the presence of a vehicle as it enters the "dilemma zone." The "dilemma zone" is defined as an area in advance of the traffic signal where the motorist can be indecisive as to whether to proceed or stop when the signal changes from green to yellow. If a vehicle is detected to be in this zone, the green phase will be extended up to a maximum green time, which allows the vehicle to proceed through the intersection without having to stop abruptly or travel through the intersection during a red phase. A GES should normally be considered at isolated intersections or when the signal is the first signal in a series of signals and the speed limit is 45 mph or greater.

DESIGN: Vehicle detection shall be provided in each through lane on the GES approaches to the signal. If vehicle detector loops are employed for detection, they shall have dimensions of 6 feet x 6 feet. The minimum green and maximum initial for these approaches should be between 20 and 30 seconds, and the maximum green time should be between 60 and 90 seconds.

The following table shows minimum gap and distances from GES loops to the stop bar for various approach grades. All GES loops should be placed in the pulse mode. When the grades on each mainline approach are different, the grade that is most critical should be used. Using the table, the critical grade will always indicate the farthest loop distance from the stop bar.

EXAMPLE: An intersection has an approach grade of -6% and another of -4%. The chart shows the loop spacing for the minus-6 percent grade to be farther from the stop bar than the -4% grade. Therefore, the -6% grade will be used, and the loop spacing for both approaches will be 259 feet for the near loop and 467 feet for the far loop. Consequently, the passage and minimum gap will be set at 3.2 seconds.

CONT.

GES Loop Spacing and Passage Time

Approach Grade (%)	Near Loop Distance from Stop Bar (feet)	Far Loop Distance from Stop Bar (feet)	Minimum Gap (seconds)
-8	278	506	3.5
-7	266	482	3.3
-6	259	467	3.2
-5	251	452	3.1
-4	244	439	3.0
-3	235	419	2.8
-2	228	406	2.7
-1	222	394	2.6
0	217	384	2.5
+1	210	369	2.4
+2	205	360	2.4
+3	201	352	2.3
+4	197	344	2.2
+5	193	336	2.2
+6	189	328	2.1
+7	185	320	2.0
+8	182	314	2.0

Typically, when a GES signal is the first signal in a series of signals, the approach from the adjacent signal does not require GES capabilities, and one mainline loop per through lane is sufficient. That loop should be 6 feet x 6 feet, installed at the near-loop spacing.

There are times when certain traffic signals should be changed from GES operation to other operations, such as fixed-time, semi-actuated, or fully actuated. Some examples are when traffic signals have been installed adjacent to the GES signal or when approach speeds have dropped to the point that a GES is no longer required. The district should be aware of when these conditions occur and make recommendations to the division for removal of the GES operation when appropriate.

At the discretion of the district, GES signals may be operated in a semi-actuated mode for certain periods of the day if there is a need to include the signal in a signal system.

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TRAFFIC OPERATIONS

Section

OPERATIONAL DESIGN

Subject

Advance Warning Flashers

PURPOSE: Advance Warning Flashers (AWF) are used to warn drivers that the green interval will terminate soon. This warning is accomplished through a combination of signing and flashing beacons, placed at a predetermined spacing from the stop bar, that are interconnected with the traffic signal controller.

GUIDELINES: Guidelines and factors that should be taken into account when considering an AWF include the following:

- Ø The signalized intersection has a high crash rate or a high percentage of angle crashes.
- Ø Posted speed limit or 85th percentile speed is 45 mph or greater.
- Ø The approach speed limit is over 45 mph, and the signalized intersection is on the extended-weight coal-haul system. This information as well as the percentage of trucks can be obtained from the Division of Planning.
- Ø Sight distance to the signal heads is restricted.
- Ø The downgrade is in excess of 4 percent.
- Ø A high number of vehicles enter the intersection at the end of the yellow phase. *High number* is defined as 12 percent or greater of the total observed traffic signal cycles.
- Ø The maximum green time is achieved for a substantial number of cycles.
- Ø A bridge deck is adjacent to the signalized intersection where typical GES loops should be placed.

If the district determines that an AWF is justified at an intersection, it shall submit the above information to the division for approval. The Advance Warning Flasher Checklist **(Exhibit 14)** should be used to document this information.

CONT.

DESIGN: The typical design for each AWF should include two signs, each being a black-on-yellow warning sign with the text PREPARE TO STOP WHEN FLASHING. One sign should be installed overhead and shall have dimensions of 72 inches x 44 inches, supplemented with a 12-inch yellow flashing beacon on each side of the sign. The other sign should be ground-mounted on the right-hand side of the road off of the roadway shoulder and shall have dimensions of 48 inches x 48 inches, supplemented with a 12-inch yellow flashing beacon on each side of the sign. At its discretion, the district may eliminate the side-mounted assembly for an AWF on a two-lane highway.

The sign assemblies should be located either 700 feet (for 45 mph highways) or 900 feet (for 55 mph highways) in advance of the intersection. The flashing operation should begin either 9 seconds (for 700 feet) or 10 seconds (for 900 feet) before the start of yellow and continue to the end of the red phase.

A maximum spacing of 1,000 feet may be used on roads with grades greater than 5 percent that appear on the extended-weight coal-haul system. If this spacing is used, the flashing operation should begin 11 seconds before the start of yellow.

AWF & GES: A signal cannot be operated with both AWF and GES capability. Once an AWF assembly begins to flash, the signal changes in a preset amount of time, and a GES system will not extend this time limit.

For new signals requiring an AWF installation, the district may elect to install one 6-foot x 6-foot loop between the AWF and the signal to act as a detection loop. For existing GES signals requiring modification to include an AWF system, one or both of the existing GES loops may be used for detection. If used, these detection loops are intended to extend the mainline green for capacity reasons and have no effect on a vehicle's dilemma zone.

RESOURCES: For further information concerning Advance Warning Flashers, refer to the *KTC-94-26 Research Report, Evaluation of Change Interval Treatments for Traffic Signals at High Speed Intersections*, published by the Kentucky Transportation Center.

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TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

Railroad Preemption

PRELIMINARY REVIEW:

If conditions are present that might justify the preemption of normal signal operation due to a highway-rail grade crossing, representatives from the district and the division shall meet to determine if preemption is necessary. The district shall prepare minutes from the meeting to document the preemption decision and will submit them in writing to the division.

If the determination is made that preemption is required, representatives from the district, division, and the associated railroad company shall meet to determine the preemption operation and any necessary modifications to the existing signal and/or railroad-warning system. Additional representation may be required from other divisions depending on the nature of the project. Involvement from the railroad company at this level is essential to ensure that the two systems complement each other. In the event the railroad is not responsive or is unable to participate, the district shall document its efforts to include the railroad representative.

PREEMPTION DESIGN:

Preemption designs shall include a minimum of five seconds of separation time. Pedestrian clearance intervals and minimum green times may be terminated or shortened in order to expedite the beginning of the queue-clearance interval.

To facilitate the clearance of the railroad tracks, temporary exclusive movements may be allowed during the queue clearance interval. Appropriate signal displays shall be used in these situations.

When a signal phase is required to clear the crossing of vehicles, the preemption scheme should be designed to clear the track of vehicles before the gate arms begin to descend. This design will decrease the possibility of gate arms coming down on vehicles, which could cause motorists to panic and/or make inappropriate maneuvers. In addition, this design will decrease the likelihood of gate arms being broken.

CONT

PREEMPTION DESIGN (cont.):

In no instance shall the district modify the signal timing at an existing signalized intersection with railroad preemption without agreement from the division. All timing modifications shall be documented in the signal file maintained by the division.

To provide short-term operation during power failure, an uninterruptable power supply (UPS) shall be installed at all railroad-preempted traffic signals. The extent of the short-term operation is limited by the capacity of the batteries.

SIGNING:

Blank-out signs should be installed to prevent turning movements from the signalized intersection toward the grade crossing, which could potentially block the intersection during preempted signal operation.

When a traffic signal is interconnected with the warning system of a highway-rail grade crossing, a DO NOT STOP ON TRACKS (R8-8) sign should be installed on the approaches to the crossing to reduce the potential for vehicles stopping on the tracks.

Where a traffic signal requires vehicles to stop in advance of the railroad tracks, a STOP HERE ON RED (R10-6) sign shall be installed to the right of the stop bar to emphasize the point at which the stop is intended to be made.

Where a traffic signal requires vehicles to stop in advance of the railroad tracks and there is insufficient clear storage distance for a design vehicle, a NO TURN ON RED (R10-11) sign shall be span-mounted adjacent to the signal head for the prohibited turning movement.

WARNING PLACARD:

A Preemption Warning Placard **(Exhibit 15)** shall be posted in the controller cabinet of any traffic signal preempted due to a nearby highway-rail grade crossing. The warning placard serves as a reminder of the interconnection between the traffic signal and the railroad warning devices. The placard shall include phone numbers for contacting the district and the railroad company. Copies of the warning placard with an adhesive backing are available upon request from the division.

ANNUAL INSPECTIONS:

The district shall coordinate annual inspections of the timing and operation of railroad-preempted traffic signals. This inspection shall include a review of all associated pavement markings and/or signing. The intent of these inspections is to ensure that both the traffic signal and railroad-warning devices continue to operate according to the mutually approved interconnection design.

CONT.

ANNUAL INSPECTIONS (cont.):

The district shall prepare an inspection report. At a minimum, the report shall include the date of the inspection, any deficiencies in the operation of the traffic signal and/or railroad-warning devices, and any necessary actions. The district shall forward copies of this report to the associated railroad company and the division.

FILE MAINTENANCE:

The division shall maintain an updated file for every railroad-preempted traffic signal in the state. At a minimum, these files shall include:

- Ø A copy of the Preemption Warning Placard
- Ø A set of signal plans including the location of all associated pavement markings and signing
- Ø An updated Traffic Signal Checklist
- Ø A copy of the existing signal timing
- Ø Pictures of the intersection
- Ø A time-sequence diagram illustrating the operation of the signal in conjunction with the railroad-warning devices
- Ø Copies of the annual inspection reports

The division shall also maintain an updated list of traffic signals with railroad preemption.

RAILROAD PREEMPTION & EMERGENCY-VEHICLE PREEMPTION:

For locations that may have both railroad preemption circuitry and emergency-vehicle preemption equipment, railroad preemption shall have priority.

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TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

Physical Design (Hardware)

INDICATIONS: Twelve-inch indications shall be used for all devices including signals, intersection control beacons, advance warning flashers, sign-mounted advance-warning beacons, and school flasher assemblies. Eight-inch beacons may be used when there is insufficient vertical clearance and it is not feasible to attain the necessary vertical clearance to use twelve-inch indications.

SIGNAL HEAD PLACEMENT: Signal heads should be provided for any entrance located within the limits of a signalized intersection if vehicle detection can be provided. *Within the limits of a signalized intersection* is defined as the space between the stop bars on the mainline. If vehicle detection cannot be provided, the mainline signal heads should be positioned so that they are visible from the entrance. If stop bars can be located so that the entrance is not within the intersection, no signal heads are required. If a minor street or driveway is located within or adjacent to the area under signal control and it has been determined that signal heads are not required due to an extremely low potential for conflict, a STOP (R1-1) sign may be placed at the entrance.

When protected-permitted phasing is used, the signal head for left-turn traffic should be located over the line separating the left-turn lane from the adjacent through lane. Lens arrangement “o” (Figure 4D-3, *Manual on Uniform Traffic Control Devices*) should be used. A LEFT TURN YIELD ON GREEN (symbolic green ball) (R10-12) sign may be used in conjunction with protected-permitted phasing.

SIGNAL SUPPORTS: All signal supports shall be designed to comply with AASHTO’s *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

CONT.

JOINT USE OF POLES: Where it is not practical to install support poles and where existing poles owned by others will suffice, joint use of poles is acceptable subject to approval of the owner. If requested by the owner of such poles, the Cabinet may enter into a general joint-use agreement similar to that shown in **Exhibit 16.** When required by the owner, this general joint-use agreement may be supplemented by a pole attachment permit similar to **Exhibit 17** for each instance in which the Cabinet makes an attachment.

SPECIAL EQUIPMENT: Requests for special equipment, materials, or installation features (such as mast arm poles, decorative poles, or underground wiring) shall be forwarded to the division. The division shall approve the selection of equipment, construction plans, and operational requirements. All additional costs in excess of a typical installation (including design, installation, and future maintenance) shall be borne by the requesting agency. A written agreement between the Cabinet and the requesting agency shall be in place prior to any design work being performed. This agreement shall address any additional costs in excess of a typical installation and shall require all future maintenance costs to be borne by the requesting agency.

CONSULTANT DESIGN: On design projects, all consultant plans shall be reviewed and approved by the division prior to submittal to the project manager.

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TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL
ELECTRICAL DEVICES

Subject

Initial Turn-On

DOCUMENTATION: The district shall be present at the initial turn-on of all new signals. The district shall notify the division when new traffic-signal installations have been completed. This notification shall be in the form of a copy of the original Traffic Signal Checklist, with the completion date and turn-on date added by the district.

PUBLIC NOIFICATION: The public shall be informed of the turn-on date for any new signal installations prior to initial turn-on. This shall be done using one or more of the following methods:

- Ø Press release
- Ø Portable changeable message signs
- Ø Fixed signage.

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TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

Maintenance

MAINTENANCE & OPERATIONAL COSTS:

The Cabinet shall be responsible for the cost of maintenance and operation of all traffic control electrical devices on state-maintained highways unless otherwise addressed by a Maintenance and Traffic Control Agreement between the Cabinet and a city or other legal entity.

MAINTENANCE LOG:

A Maintenance/Repair Record shall be established and maintained by the district or other responsible legal entity for all traffic control electrical devices. The record shall include identification of device, date and time of repair, reason for action, and corrective action. These records shall be kept on file in accordance with the Cabinet's record retention schedule.

PREVENTIVE MAINTENANCE:

A Preventive Maintenance (PM) program shall be established and performed by the district or other responsible legal entity. This program shall be a systematic and scheduled inspection to include the following items:

- Ø Cleaning and adjustment of equipment
- Ø Inspection of support structures
- Ø Inspection of overhead equipment

A PM checklist shall be created and utilized by each district. The completed PM checklist shall include:

- Ø Identification of the device
- Ø Date and time of PM inspection
- Ø Signature of the person conducting the inspection

The PM checklist shall be kept on file in accordance with the Cabinet's record retention schedule.

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TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

Permitted Installations

APPROVAL PROCESS: Signals may be installed or modified through the encroachment permit process as outlined below and in the *Permits Manual*. All such installations or modifications shall be approved in accordance with **Chapter TO-602** of this manual. Any modification to the applicant's entrance necessary to accommodate signalization shall be the responsibility of the applicant at no expense to the Cabinet.

REQUIREMENTS: Signals installed or modified under this provision shall be in accordance with the Cabinet's policies and specifications. In all cases where equipment (poles, detectors, etc.) is installed off right of way, a permanent easement shall be provided. Upon release of the permit, all equipment shall become the property of and be maintained and operated by the Cabinet unless otherwise addressed by a Maintenance and Traffic Control Agreement with a city or other legal entity. These requirements shall be included as conditions of the encroachment permit. If the applicant desires special equipment such as decorative poles, the applicant shall follow the procedures outlined in **Chapter TO-605** of this manual.

TRAFFIC IMPACT STUDIES: For new or expanding private developments, the applicant shall furnish a traffic impact study to the Cabinet for review. The study shall be performed by a prequalified consultant in Traffic Engineering Services. This traffic impact study shall include:

- Sufficient data to determine if signalization is warranted
- Optimal signal phasing and timing
- Any other improvements that may be necessary

SIGNAL PLANS: After approval for a new installation or modification has been granted, the applicant shall submit a set of signal plans for approval through the permits process. A consultant prequalified in Electrical Engineering Services shall prepare the plans.

CONT.

COST PARTICIPATION: All labor, equipment, and materials required to complete signal installations and modifications shall be the sole responsibility of the applicant.

INSTALLATION METHODS: There are two methods by which a traffic signal may be installed or modified as part of an encroachment permit. They include:

- Option #1 – Applicant installs signal with his own prequalified electrical contractor. Before any field work is started, the contractor shall meet with the district.

- Option #2 - At its discretion, the district may choose to perform the installation or modification. If this option is chosen, the district shall bill the applicant for one-hundred percent of the total cost of the labor, materials, and equipment required for the installation.

EQUIPMENT: The Cabinet has identified a list of key equipment that shall be supplied by the Cabinet's transportation warehouse but paid for by the applicant on all permitted installations/modifications. The following process shall be followed to ensure that equipment is available and/or paid for by the developer:

1. Applicants shall submit a completed Permit Installed Items Spreadsheet (available from Download Files section of the Division of Traffic Operations website) with the traffic signal plans for review. Shop drawings shall be submitted for materials used in the installation/modification of a signal that are not included on the Permit Installed Items Spreadsheet.

2. Upon receipt of the Permit Installed Items Spreadsheet, the Division shall initiate the development of a task order for the installation/modification. The Division shall send a copy of the Permit Installed Items Spreadsheet (including task order number) to the transportation warehouse.

3. Before picking up any equipment, the applicant's contractor shall notify the transportation warehouse at least two days in advance of their arrival. Failure to provide this advance notification may result in long delays or refusal to distribute equipment upon arrival.

4. When equipment is picked up by the electrical contractor, the warehouse shall charge it to the appropriate task order number.

5. When the Division determines that a signal installation/modification is complete (normally determined by a final inspection), charges applied to the task order number shall be billed to the applicant.

CONT.

INSPECTIONS: The division shall conduct an inspection following all signal installations or modifications to existing signals performed as part of a permit. Once the district notifies the division that the installation is completed, the division shall complete the inspection within a maximum of 60 days after the notification date. Any corrective work identified as part of this inspection will need to be completed prior to releasing the bond for the permit.

TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

Traffic Control for Emergency Vehicles

TRAFFIC SIGNALS FOR EMERGENCY-VEHICLE ACCESS: Upon request from an emergency service agency, a traffic signal may be installed or modified to expedite the entry of emergency vehicles (fire trucks, EMS vehicles, etc.) onto a highway from the emergency service facility. While other intersections may be considered, these signals are primarily intended for entrances that serve as direct access to the emergency service agency.

The signal-approval procedures for these signals shall be in accordance with **Chapter TO-602** of this manual. All costs associated with these installations shall be the responsibility of the requesting agency.

EMERGENCY-VEHICLE PREEMPTION SYSTEMS: Emergency vehicle preemption can be described as a special operation of a traffic signal that attempts to give an authorized emergency vehicle a green indication for the direction of traffic from which the approaching emergency vehicle is arriving. This is achieved by special equipment located inside the traffic signal controller and either on the emergency vehicle or inside the emergency facility.

All requests for emergency-vehicle preemption on state-maintained routes shall be submitted to the division for review and approval.

The requesting agency shall be responsible for all costs associated with the initial installation and future maintenance of the emergency-vehicle preemption equipment. This equipment may be located in the signal controller, mounted on the signal span wire, or attached to the mast arm/signal pole. It is the responsibility of the requesting agency to maintain all other associated components of the emergency-vehicle preemption equipment such as the transmitters on authorized emergency vehicles.

CONT.

EMERGENCY-VEHICLE PREEMPTION SYSTEMS (cont.): If a traffic signal is preempted by an authorized emergency vehicle, the overall operation of the signal should be as follows:

- Ø All pedestrian phases shall immediately be terminated.
- Ø When preempted, the signal shall provide standard, unaltered timing for yellow and all-red clearances prior to showing a green indication to the preempted approach.
- Ø If an approach displays a green indication during the initial preemption call in the direction of travel of an authorized emergency vehicle, the display shall remain green throughout the preemption phase.
- Ø At the end of the preemption call, the signal shall resume normal operation.
- Ø An all-red intersection display is normally not an acceptable method for providing emergency vehicle preemption.

DOCUMENTATION: The requesting agency shall be required to obtain a permit for both the installation of emergency-vehicle preemption systems and the installation of traffic signals for emergency-vehicle access. For traffic signals installed to provide emergency-vehicle access, the agency shall be responsible for all costs associated with the traffic signal. For emergency-vehicle preemption systems, the requesting agency shall be responsible for all costs of equipment, installation, and future maintenance of the preemption equipment.

RAILROAD PREEMPTION & EMERGENCY-VEHICLE PREEMPTION: For locations that may have both railroad preemption circuitry and emergency-vehicle preemption equipment, railroad preemption shall have priority.

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TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

Flashing Beacons

DEFINITION: Flashing beacons include intersection control beacons and advance warning beacons installed on warning and regulatory signs.

DESIGN: These devices shall conform to the *Manual on Uniform Traffic Control Devices* with the following exceptions and additions:

- Ø Flashing beacons shall be 12 inches in diameter. Automatic dimmers should be provided for all indications in which nighttime visibility of a warning device is compromised by the brilliance of the indications. Eight-inch beacons may be used when there is insufficient vertical clearance and it is not feasible to attain the necessary vertical clearance to use 12-inch indications.

- Ø Intersection control beacon installations shall include a minimum of two signal indications for each approach.

- Ø Unless otherwise specified on the Traffic Signal Checklist, the two beacons shall flash in an alternating pattern.

- Ø Flashing beacons used in school speed limit assemblies should be oriented vertically, with one beacon above and one beacon below the sign. Beacons used to supplement warning and other regulatory signs should be oriented horizontally, with one beacon on each side of the sign.

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TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

School Flasher Assemblies

APPROVAL: A signed school speed zone Official Order shall serve as approval for the installation of school-flasher assemblies.

ASSEMBLIES: The assemblies should consist of a SCHOOL SPEED LIMIT sign (R5-1) and two 12-inch yellow indications, one mounted above the sign and one mounted below the sign. The indications shall flash alternately. School flasher assemblies may be installed on a pole located on the right-hand side of the roadway or may be installed overhead on a span wire or mast arm. On four-lane undivided or wider facilities, an overhead installation should be used. See **Section TO-402-5** for additional guidance on school speed limits.

OPERATING TIMES: Due to the restrictive nature of school speed limits, school flasher assemblies should be in operation only during times of peak vehicular or pedestrian traffic. In general, they should operate in the morning approximately 25 minutes before and 10 minutes after the school's convening time. In the afternoon, the period of operation should be 10 minutes before and 25 minutes after the school's dismissal time. These time frames may be adjusted based on site-specific conditions; however, school flasher assemblies should rarely be in operation for longer than 35 consecutive minutes.

Although these devices should normally be placed in operation only for the school's convening and dismissal times, additional periods of operation may be justified if a large amount of school traffic is present.

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TRAFFIC OPERATIONS

Chapter

TRAFFIC CONTROL ELECTRICAL DEVICES

Subject

Signal Systems

REQUESTS: All requests for new signal systems, or the addition of signals to an existing system, shall be submitted to the division for review. Emphasis should be placed on maintaining existing systems, increasing capacity, and improving traffic flow on our highways.

COMMUNICATION: If the system request is approved by the division, all equipment shall be provided by the division. If requested, the division will provide technical support to connect all hardware necessary for an effective system.

TIMING: Timing for signal systems shall be the responsibility of the district. When requested, the division shall provide support to develop initial timing and provide assistance if changes or adjustments in the timing are needed.

MAINTENANCE: The effectiveness of a signal system is dependent upon the maintenance of the system. The following maintenance activities should be performed by the district:

- Ø Maintain system timing and hardware
- Ø Review timing for a signal system every three years or when an obvious change in traffic patterns or volumes occur
- Ø Evaluate each signal within a system on a regular basis to ensure that it has the correct timing and time of day
- Ø Evaluate the communication system on a regular basis to ensure that the master control is communicating with all local controllers

PERFORMANCE MEASURES: The division shall evaluate each new system to determine performance before and after a system is in place. In addition, the division shall routinely evaluate existing systems to determine the effectiveness of the system's roadway performance and how well the system's communication is being maintained.

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Purpose

OVERVIEW: Lighting is defined as the use of various light sources along or near highways to improve night visibility and safety. Lighting types include:

- Ø Roadway
- Ø Bridge
- Ø Navigation
- Ø Tunnel
- Ø Aviation obstruction

The purpose of this chapter is to establish guidelines under which the Cabinet approves, designs, installs, operates, and maintains lighting on state highways.

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Design, Installation, Maintenance, & Operation Responsibility

RESPONSIBILITIES OF CABINET:

The Cabinet is responsible for the design, installation, maintenance, and operation (utility costs) of lighting for the following facilities:

- Ø Fully controlled-access highways, interstates, and toll roads
- Ø Other roadways on the state highway system outside city limits
- Ø Bridges on roadways on the state highway system over navigable bodies of water
- Ø Tunnels on roadways on the state highway system
- Ø Navigation lighting on state-maintained bridges over navigable bodies of water
- Ø Aviation obstruction lighting on state-maintained structures

The Cabinet may design and install standard bases, conduits, and junction boxes on any bridge or median barrier wall on the state highway system in conjunction with a construction project for future lighting by others, regardless of the responsibilities listed above.

The district shall be responsible for the maintenance and utility costs of the above lighting. The division or an engineering consultant typically designs plans for the installation of lighting by an electrical contractor. The Cabinet may enter into agreements with local governments or electric utility companies for any or all of these responsibilities.

RESPONSIBILITIES OF OTHERS:

The Cabinet shall not be responsible for the design, installation, maintenance, or operation of aesthetic lighting or lighting on any facility not listed above. An encroachment permit shall be required for any lighting installed on state right of way by others.

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Approval

INTERSECTION LIGHTING:

The installation of intersection lighting shall require the written approval of the division. In such cases, the district shall submit a request for approval to the division. At a minimum, the request shall include an engineering study with the following supporting documentation:

- Ø Crash summary and crash reports (sorted into day and night collisions as indicated in the Light Condition field on the crash reports)
- Ø Traffic volume data
- Ø Availability of electrical service
- Ø Preliminary cost estimate and/or scope of the proposed installation

INTERCHANGE LIGHTING:

The installation of interchange lighting shall require the approval of the Deputy State Highway Engineer for System Preservation and Operations if it involves six-year plan funding designated for safety or lighting. Lighting of interchanges using other sources of funding shall require the approval of the division. In all cases, the district shall submit a request for approval to the division. At a minimum, the request shall include an engineering study with the following supporting documentation:

- Ø Crash summary and crash reports (sorted into day and night collisions as indicated in the Light Condition field on the crash reports)
- Ø Traffic volume data

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Warranting Conditions

CONTINUOUS LIGHTING: Warrants for continuous lighting are listed in AASHTO's *An Informational Guide for Roadway Lighting*.

INTERCHANGE LIGHTING: Complete interchange lighting is warranted if any of the following conditions are satisfied:

- Ø The average daily ramp traffic entering and leaving the freeway within the interchange areas exceeds 5,000.
- Ø The average daily traffic (ADT) on the crossroad exceeds 5,000.
- Ø Existing substantial commercial or industrial development that is lighted during hours of darkness is located in the immediate vicinity of the interchange, or the crossroad approach legs are lighted for one-half mile or more on each side of the interchange.
- Ø The ratio of the night-to-day crash rate within the interchange area is at least 1.5, and a study indicates that lighting may be expected to result in a significant reduction in the nighttime crash rate.
- Ø Continuous lighting has been installed on the through freeway

PARTIAL INTERCHANGE LIGHTING: Partial interchange lighting shall not be used on state highways.

BRIDGE LIGHTING: Bridge lighting is warranted if any of the following conditions is satisfied:

- Ø Bridge is located over a navigable body of water
- Ø Bridge has sidewalks for pedestrian movements
- Ø Bridge is located within a section of freeway where continuous lighting is warranted

CONT.

INTERSECTION LIGHTING:

Intersection lighting is warranted if any of the following conditions is satisfied:

- Ø Nighttime critical rate factor is 2.0 or greater, at least three or more nighttime crashes have occurred in a recent three-year period, and a study indicates that lighting may be expected to significantly reduce the nighttime crash rate.

- Ø Minimum Vehicular Volume or Interruption of Continuous Traffic Warrant criteria is satisfied for at least one hour between the hours of 9:00 p.m. and 5:00 a.m. on a typical night.

- Ø An intersection has raised channelization within the limits of the mainline of an unbifurcated highway where the 85th percentile approach speed exceeds 40 mph (the limits of the mainline being defined as the typical shoulder areas, the travelway(s), and the median).

- Ø The cross product of vehicles turning left versus opposing traffic exceeds 25,000 for two-lane highways or 50,000 for four-lane highways for at least one hour between the hours of 9:00 p.m. and 5:00 a.m. on a typical night.

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Priority Listing

PRIORITY LISTING: The division shall maintain a prioritized list of existing interchanges with lighting needs. The division shall review and modify this list on an annual basis.

When funding becomes available to fund an interchange lighting project, the decision as to which interchange receives lighting should be based on the rankings of the prioritized list.

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Design Requirements

ROADWAY LIGHTING:

Roadway lighting should be designed to provide the level and uniformity of illumination set forth by AASHTO's *An Informational Guide for Roadway Lighting.* Also recommended for reference is the Illuminating Engineering Society of North America's (IESNA) *RP-8-00,* which contains lighting levels and uniformity ratios for local street and urban arterial roadways. For design of intersection lighting, the Kentucky Transportation Center's report, *Roadway Lighting and Driver Safety*, is recommended for reference. As discussed in this report, AASHTO lighting guidelines can sometimes be satisfied using a limited number of properly located luminaires. As a result, intersection lighting may range from a simple access delineation project (such as two luminaires on diagonal quadrants of the intersection) to large-scale projects (such as lighting an entire intersection and/or approaches).

TUNNEL LIGHTING:

Tunnel lighting should be designed using AASHTO criteria to provide a range of illuminance values and uniformity ratio. IESNA's *RP-22-96* should be referenced to provide a range of luminance values and ratios.

LIGHTING STRUCTURES:

Roadway lighting structures shall be designed in accordance with AASHTO's *Roadside Design Guide* to minimize roadside hazards. Breakaway supports and base heights shall conform to the requirements of AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.*

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Permitted Installations

APPROVAL: If roadway lighting is to be installed through the permit process, written approval from the division is not required. However, all encroachment permits involving roadway lighting shall be reviewed by the division. Final approval of the permit shall serve as approval for the lighting installation.

RESPONSIBILITIES OF APPLICANT: The applicant shall be responsible for all design, installation, maintenance, and operational costs associated with the lighting installation.

DESIGN: All lighting installations to be installed through the permit process shall be designed by a prequalified consultant in Electrical Engineering Services, except lighting projects to be installed by a utility company. The division may be contacted prior to the design of permitted lighting installations to determine the level of review and design requirements required for a particular project.

CONSTRUCTION: All permitted lighting installations shall be installed by a prequalified electrical contractor, except lighting projects installed by a utility company.

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Navigation Lighting

NAVIGATION LIGHTING:

The Cabinet shall be responsible for navigation lighting on bridges when the United States Coast Guard requires such lighting. The Cabinet shall follow all applicable sections of *Enclosure 6, COMDTINST M 16590.5A, Bridge Administration Manual of the United States Coast Guard,* when this lighting is required.

The district shall be responsible for the maintenance of navigation lighting. The district should conduct periodic inspections of navigation lighting and keep records of the inspections.

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TRAFFIC OPERATIONS

Chapter

LIGHTING

Subject

Aviation Obstruction Lighting

AVIATION OBSTRUCTION LIGHTING:

The Cabinet shall be responsible for aviation obstruction lighting when the Federal Aviation Administration requires such lighting. The Cabinet shall follow all applicable sections of *Federal Aviation Administration Advisory Circular 70/7460-1F* when this lighting is required.

The district shall be responsible for the maintenance of aviation obstruction lighting. The district should conduct periodic inspections of this lighting and keep records of the inspections.

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TRAFFIC OPERATIONS

Chapter

MISCELLANEOUS TOPICS

Subject

Islands

GENERAL: Islands provide for the separation of movements into defined paths of travel to facilitate the safe and orderly movement of vehicles, pedestrians, and bicycles. They serve three primary functions:

- Ø To control and direct traffic movement (usually turning movements)
- Ø To divide opposing or same-direction traffic streams (usually through movements)
- Ø To provide refuge for pedestrians

Islands range from an area delineated by a raised curb to an area delineated by pavement markings. Proper channelization increases capacity and improves safety. Improper channelization has the opposite effect and may be worse than having none at all.

APPROVAL: Islands may be installed at the discretion of the district.

RESOURCES: For guidance on islands, refer to the *Manual on Uniform Traffic Control Devices* and AASHTO's *A Policy of Geometric Design of Highways and Streets.*

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TRAFFIC OPERATIONS

Chapter

MISCELLANEOUS

Subject

Rumble Strips

GENERAL: Rumble strips are bands of raised material or indentations formed or grooved in the traveled lanes or shoulders. Rumble strips can call attention to standard warning or regulatory devices by alerting the driver through sound and vibration of the vehicle.

TRANSVERSE RUMBLE STRIPS: Transverse rumble strips are placed across lanes of traffic perpendicular to approaching vehicles. They are normally used to warn of stop or near-stop conditions on high-speed highways. If used, they shall be used in conjunction with signs or other warning devices. Since rumble strips can be a potential hazard by breaking tire contact with the roadway surface, it is important that they not be located on curves or too close to actual stop conditions.

Some typical locations where transverse rumble strips have been used include:

- Ø In advance of the end of a freeway
- Ø In advance of toll booths
- Ø In advance of an intersection where the motorist is not expecting to stop, particularly a “T” intersection or mid-block crosswalk
- Ø Within a construction zone in advance of the workers

Some disadvantages of transverse rumble strips are:

- Ø They present problems to bicyclists and motorcyclists.
- Ø Nearby residents may be subjected to excessive noise.
- Ø Motorists may make unusual maneuvers to avoid rumble strips.
- Ø They can break tire contact with the roadway surface, creating a potential hazard.

CONT.

TRANSVERSE RUMBLE STRIPS (cont.):

Permanent transverse rumble strips shall be approved by the division. When approval to install transverse rumble strips is requested by the district, all available supporting data should be submitted to the division for evaluation. This submittal should include such items as crash data, sight-distance limitations, and other relevant information.

Temporary transverse rumble strips may be installed at the discretion of the district on approaches where stop control has recently been modified.

Methods of installation for transverse rumble strips include:

- Ø Thermoplastic material—Such installations should include 2 layers of thermoplastic material, providing a total thickness of 3/8 inch. The width of the individual strips should be 6 inches with a 24-inch space between strips.

- Ø Preformed material—Manufacturer's recommendations should be considered for such installations.

- Ø Cut or milled strips—Such installations should have a maximum depth of 3/8 inch, width of 7 inches, and spacing of 24 inches between strips.

In most cases, the preferred method of installation for transverse rumble strips is the use of thermoplastic or preformed material. White material should not be used in areas where the rumble strips could be mistaken as a crosswalk. In such cases, the thermoplastic shall be either black or gray to match the color of the pavement.

Temporary installations shall utilize thermoplastic or preformed material. Temporary installations may be allowed to wear naturally and shall not be reinstalled. Reapplication of material will be considered a permanent installation and shall require approval of the division.

Installations of transverse rumble strips should contain three sets of eight strips. Some unusual situations may be encountered in which more sets or more strips per set will be required. The specific strip design is dependent on the selected method of installation.

Since all roadways may have cyclists, installation of transverse rumble strips should not be made within the outer two feet of the traveled lane unless there exists a minimum of four feet of paved shoulder, outside the normal shoulder rumble strips, along the roadway.

CONT.

SHOULDER RUMBLE STRIPS: The use of shoulder rumble strips is discussed in the *Kentucky Standard Specifications for Road and Bridge Construction* and *Kentucky Department of Highways' Standard Drawings*.

CENTERLINE RUMBLE STRIPS: Although centerline rumble strips have the potential for improving safety, they are considered an experimental device in Kentucky. As a result, they shall be approved by the division.

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TRAFFIC OPERATIONS

Chapter

MISCELLANEOUS TOPICS

Subject

Speed Humps

SPEED HUMPS: Speed humps are traffic calming devices that require motorists to reduce travel speeds as they drive over the device. Speed humps differ from speed bumps in that they are typically wider (12 feet to 14 feet) and shorter in height (3 inches) than speed bumps. The longer width of the speed hump increases the impact to vehicles at higher speeds and is more comfortable at lower speeds.

Speed humps are recognized by the *Manual on Uniform Traffic Control Devices*. However, they typically are not installed on state-maintained highways because they often hinder the efficient flow of vehicles, serve as hazards to emergency vehicles, and create obstacles to roadway maintenance. In rare instances, speed humps may be installed on state-maintained highways. In all cases, the installation of speed humps shall require the approval of the division.

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TRAFFIC OPERATIONS

Chapter

MISCELLANEOUS TOPICS

Subject

Speed Bumps

SPEED BUMPS: Attorney General's opinion #81-90, in reference to Kentucky Revised Statute 189.337 and 603 KAR 5:050, states that there is no statutory or regulatory authority for the placement or installation of speed bumps on public highways. In the opinion of the Attorney General's office, the absence of any reference to speed bumps in the *Manual on Uniform Traffic Control Devices* implies its deliberate exclusion.

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TRAFFIC OPERATIONS

Chapter

MISCELLANEOUS TOPICS

Subject

Roundabouts

OVERVIEW: Discussed are roundabouts including their common features, benefits, and appropriate uses on state highways. Also included is a discussion on the comparison of roundabouts to other forms of intersection control and a recommended review process.

FEATURES: Roundabouts are circular intersections with the following key characteristics:

- Ø Yield control of all entering traffic
- Ø Channelized approaches
- Ø Special geometry to control travel speeds on the circulatory roadway

USES: Roundabouts can provide safe and efficient traffic flow in certain situations and should be considered as a viable form of intersection control on state highways. While roundabouts are commonly used to improve aesthetics or calm traffic, justification for roundabouts on state highways should primarily be limited to the following:

- Ø Improving capacity
- Ø Improving safety
- Ø Reducing queue storage requirements
- Ø Accommodating unusual intersection geometry

CAPACITY ISSUES: Roundabouts can improve capacity at intersections with relatively balanced traffic flows on the major and minor street approaches and at intersections with heavy left-turn volumes. T-intersections are often good candidates for roundabouts because they tend to have higher left-turning volumes. Roundabouts will normally improve traffic flow at intersections where the *Manual on Uniform Traffic Control Devices* warrants for all-way stop control are satisfied.

CONT.

SAFETY ISSUES:

Roundabouts are generally safer than other forms of intersections in terms of number of crashes and crash severity. These safety benefits are primarily attributed to reduced traffic speeds at entries, a reduced number of potential conflict points, and the ease of the decision-making process for entering motorists. The safety advantages diminish with high traffic flows, particularly with regard to pedestrians and bicyclists.

REVIEW PROCESS:

Roundabouts have limitations and are not the solution to all traffic problems at all locations. Careful study is required to identify the most appropriate control mode at any given intersection.

The initial stage of the review process for a potential roundabout installation involves a broad review of conditions to determine whether further consideration is justified. If a roundabout is determined to be a viable form of intersection control, the location should be analyzed to determine if a roundabout would function at an acceptable level of service. The analysis will typically include but is not limited to geometric layouts, cost estimates, and performance indicators (such as volume/capacity ratios, delays, LOS, and/or queue lengths). If a roundabout is found to function acceptably, its performance should be compared to that of other potential forms of control (such as two-way stop, signalization, and multi-way stop).

The review process should provide answers to the following questions:

- Will a roundabout likely reduce delay, improve safety, or solve some other operational problem?
- Does the analysis suggest that a roundabout would be a more favorable form of intersection control than other more conventional intersection-control methods?
- Can complicating factors be mitigated?

If these questions are answered favorably, then a roundabout may be considered as a possible form of intersection control. *A Roundabout Justification Study,* **Exhibit 19,** is provided to assist the reviewer and to ensure adequate documentation of the review process. An electronic copy of the justification study is available from the division upon request.

The division shall review all proposals for the use of roundabouts on design projects. At a minimum, the project manager will submit a completed copy of the *Roundabout Justification Study* to the division. Upon review, the division's recommendation and comments will be forwarded to the project manager. However, the decision to use a roundabout rests with the project team.

CONT.

RESOURCES: For a more detailed discussion on roundabouts, refer to AASHTO's A *Policy on Geometric Design of Highways and Streets* and the Federal Highway Administration's *Roundabouts: An Informational Guide*.

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TRAFFIC OPERATIONS

Chapter

MISCELLANEOUS TOPICS

Subject

Runaway Truck Ramps

RUNAWAY TRUCK RAMPS: Runaway truck ramps shall be marked and signed in accordance with **Exhibit 20.**

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TRAFFIC OPERATIONS

Chapter

MISCELLANEOUS TOPICS

Subject

Changeable Message Signs

OVERVIEW: The effective use of changeable message signs (CMS) requires individual consideration due to the specific location or purpose of each installation. However, there are elements that are constant in nearly all applications. This chapter provides recommended guidelines in order to maintain a level of uniformity while also allowing flexibility based on regional experience and engineering judgment.

APPLICATIONS: The primary purpose of a CMS is to advise the driver of unexpected traffic and routing situations. Examples of situations where a CMS can be effective include:

- Ø Closures (road, lane, bridge, ramp, shoulder, interstate, etc.)
- Ø Changes in alignment or surface conditions
- Ø Significant delays/congestion
- Ø Construction/maintenance activities
- Ø Detours/alternate routes
- Ø Special events with traffic and safety implications
- Ø Crashes/incidents
- Ø Vehicle restrictions (width, height, weight, flammable, etc.)
- Ø Advance notice of new traffic control device
- Ø Real-time traffic conditions
- Ø Weather, driving, and environmental conditions
- Ø Public service announcements that improve highway safety
- Ø Emergency situations
- Ø Referral to highway advisory radio
- Ø Messages approved by the State Highway Engineer
- Ø Special campaigns that have a specified beginning and ending date
  Note: Signs should not be used for more than three weeks with any campaign.

CONT.

APPLICATIONS (cont.):

CMS should not be used for the following purposes:

- Ø Replacement of standard traffic control devices (e.g., regulatory signs, warning signs, guide signs, pavement markings, flashing arrow panels, etc.)
- Ø Advertising, unless the event requires an action to be taken by driver (e.g., EVENT TRAFFIC NEXT EXIT)
- Ø Display of generic messages
- Ø Display of test messages on portable signs
- Ø Describing recurrent congestion (e.g., normal rush-hour congestion)
- Ø Display of non-traffic-related public service announcements

MESSAGES:

The following are basic principles for the development of appropriate CMS messages:

- Ø Drivers should be able to read the entire message twice while traveling at the posted speed.
- Ø No more than two message panels should be used. Three panels may be used on roadways where vehicles are traveling less than 45 mph.
- Ø The message on each panel should be short and concise, and convey a single thought.
- Ø Unrelated messages/panels should not be displayed on the same sign.
- Ø Scrolling text should not be used.
- Ø Messages should not contain both the words *left* and *right*.
- Ø Standardized abbreviations should be used.
- Ø Messages should be accurate and timely.
- Ø Filler/unnecessary words (e.g. *caution, a, an, the*) should not be used.
- Ø Local names or landmarks should not be used.
- Ø Words (not numbers) should be used for dates.

CONT.

PLACEMENT: Proper placement of the CMS is important to ensure that the signs are visible to the driver and provide the driver ample time to take the necessary action. The basic principles for placement of CMSs are:

- Ø Signs should be visible for at least one-half mile under ideal daytime and nighttime conditions.
- Ø Sign legends should be legible from all lanes for a minimum of 650 feet.
- Ø When two signs are needed, signs should be placed on the same side of the highway and at least 1,000 feet apart.
- Ø Signs should be placed behind semi-rigid or rigid protection (guardrail, barrier) or outside the clear zone. If a sign cannot be protected or located outside the clear zone, the sign shall be delineated with channelization devices along a standard shoulder taper.
- Ø Signs should be placed 1,000 feet in advance of a work zone and at least one mile ahead of the decision point.
- Ø Signs should normally be placed on the right-hand side of the highway but should be placed on the side of the highway closest to the affected lane.
- Ø Signs should not be dual-mounted.
- Ø Trailer hitches should be pointed downstream.
- Ø To prevent theft, signs should be secured to an immovable object.
- Ø Signs should not be placed in sags or just beyond crests.
- Ø Signs should be placed to limit glare caused by the sun.
- Ø Signs should be turned three degrees outward from perpendicular to the edge of pavement.
- Ø The bottom of signs should be seven feet above the elevation of the edge of roadway.
- Ø Signs should be removed when not in use.

2 2 2

TRAFFIC OPERATIONS

Chapter

EXHIBITS

Subject

Table of Exhibits

EXHIBIT NUMBER	FORM TITLE	FORM NUMBER
01	Maintenance and Traffic Contract	TC 71-11
02	Consent and Release	TC 71-14
03	HES Project Submittal Form	*(none)*
04	HES Project Scope/Corrective Measures Worksheet	*(none)*
05	Typical Truck Lane Signing and Markings	*(none)*
06	Typical Transition Signing and Markings	*(none)*
07	Striping of 100:13 Right-Turn Tapers	*(none)*
08	Typical Markings at Signalized Intersections	*(none)*
09	Raised Pavement Marker System	*(none)*
10	Traffic Signal Checklist	TC 72-4
11	Traffic Signal Warrant Analysis	TC 72-6
12	School Flasher Form	*(none)*
13	General Phasing Diagram	*(none)*
14	Advance Warning Flasher Checklist	*(none)*
15	Preemption Warning Placard	*(none)*
16	General Joint-Use Agreement	*(none)*

CONT.

EXHIBIT NUMBER	FORM TITLE	FORM NUMBER
17	Pole Attachment Permit	*(none)*
18	Items for Install	*(none)*
19	Roundabout Justification Study	*(none)*
20	Runaway Truck Ramp Signing and Markings	*(none)*
21	Bicycle / Share the Road Warning Sign Request Form	TC 72-103
22	Measurement of Clearance Distances	*(none)*
23	Traffic Signal Clearance Intervals	*(none)*

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT

MAINTENANCE AND TRAFFIC CONTRACT

THIS CONTRACT made and entered into this _____day of _____, 20_____, by and between the Commonwealth of Kentucky, through its agent, the Transportation Cabinet, hereinafter referred to as the Cabinet, party of the first part and the City of _____, hereinafter referred to as the City, party of the second part.

WITNESSETH:

WHEREAS, the Transportation Cabinet has designated certain streets, viaducts, and bridges or portions thereof and which are enumerated in paragraph eight of this contract as connecting links to roads on the State Primary Road System or as necessary feeder streets thereto and which the Cabinet, therefore, will assume the maintenance of the vehicular traveled portion of such roads, streets, bridges, and viaducts and the storm sewers and storm sewer appurtenances constructed by it, except as provided in this contract. Vehicular traveled portion of roads and streets is defined as follows: where curb exists, the traveled portion will extend from back of curb to back of curb; where no curbs exist, the traveled portion will include the street surface plus the normal shoulders; and

WHEREAS, the Cabinet is charged by law with maintaining the State Primary Road System; and

WHEREAS, in maintaining such a system and the connecting links and the necessary feeder streets thereto, it is necessary that traffic control devices be located in the public roads of the City in proximity to the intersection of such roads with the State Primary Road System or with the connecting links thereof on roads in the City which are part of the State Primary Road System;

NOW THEREFORE, for and in consideration of the premises and the following undertakings, the parties mutually agree as follows:

1. Except as otherwise provided in this contract, the Cabinet shall assume the maintenance of the vehicular traveled portion of such roads, streets, viaducts, and bridges to which this contract applies and which are enumerated in paragraph eight of this contract and those storm sewers and storm sewer appurtenances constructed by it.

2. The Cabinet will provide snow and ice control on these city streets specifically listed in paragraph ten. The City will assist in this operation by providing control over parking and traffic patterns when requested by the Cabinet.

3. The City will not pass any ordinances or resolution concerning those roads, streets, viaducts, and bridges to which this contract applies without first having submitted to the Cabinet a copy of such ordinance or resolution at least five days prior to the time such ordinance is to be voted on and this shall include ordinances and resolutions relating to changes in the city limits.

4. The City shall pass any necessary parking or other ordinance or resolution so as to insure the maximum use of such roads, streets, viaducts, and bridges for vehicle travel consistent with the standards of safety as formulated by the Cabinet.

5. The City will permit the Cabinet to install and maintain traffic devices such as, but not limited to, vehicle detectors, signs, island and pavement markings within the City so as to regulate the flow of traffic to and from the roads of the City to and on the roads constructed, reconstructed, and maintained by the Cabinet.

6. The City will pay all costs of the purchase of power for the operation of traffic signals and street lights, except highway lighting and sign lights on interstate routes and toll roads, and for sweeping, removal of debris, and snow and ice removal unless specifically listed in paragraph ten.

7. If the City is unable to perform the maintenance required of it by this contract, the necessary maintenance shall be performed by the Cabinet and the City will reimburse the Cabinet for the expenses incurred by the Cabinet in performing such maintenance.

8. The provisions of this contract shall apply to the portions of the following routes which are now or shall in the future be annexed in the City:

SEE ATTACHED LISTING

9. The City shall not issue building permits for any private or commercial construction which requires access to a street or road listed in this contract until an access permit has been issued by the Kentucky Department of Highways.

10. SPECIAL PROVISIONS:

11. This contract supercedes all maintenance and traffic (excluding Form TC 61-39) contracts between the Kentucky Transportation Cabinet and the City of _____ executed prior to the execution date appearing hereon.

_____ _____
SECRETARY OF TRANSPORTATION TITLE
OR DESIGNATED REPRESENTATIVE
(See General Administration Guidance Manual)

Approved as to form and legality

_____
Office of Legal Services
Transportation Cabinet

City OF_____
PARTY OF SECOND PART

_____

_____

I, _____, of the City of _____, do hereby certify that the _____ of the City of _____, whose signature appears above, was authorized to execute this agreement by action of the City legislative body on _____, 20_____, and as recorded in _____ Book, page _____.

_____

_____

EXHIBIT 2

KENTUCKY TRANSPORTATION CABINET
Division of Operations

TC 71-14E
Rev. 08/01

CONSENT AND RELEASE

COUNTY_____ PROJECT NO._____

ROAD NAME_____

WHEREAS, the Transportation Cabinet, Commonwealth of Kentucky, finds it necessary in order to protect Highway No. _____to do the following work:

_____

_____

_____

_____

on the land of _____

_____County, Kentucky

NOW, THEREFORE, in consideration of the above and the incidental benefits accruing to the property, I hereby consent and agree that the Transportation Cabinet may come upon the above property and do the work as set out above, and do further agree that I will assert no claim for damages against the Transportation Cabinet by reason of said work, but by these presents shall be forever barred.

This, the _____day of _____, 20 _____.

_____

_____

WITNESS: _____
Projects Engineer or Maintenance Foreman

APPROVED: _____
Chief District Engineer

EXHIBIT 3

HES PROJECT SUBMITTAL FORM

DISTRICT: _____ **COUNTY:** _____

ROUTE: _____ **MILEPOST:** _____ **to** _____

DATE: _____ **ADT:** _____

Attach County,City Map Section Showing Project Location. Legend Should List County/City, Route, MP, Road Name

DESCRIPTION OF PROJECT: _____

_____

_____

_____

NOTE TRANSPORTATION CENTERS' REDUCTION FACTORS

CONSTRUCTION BY: (*State Forces or Contractor*) _____

SPECIFIC CRASH PROBLEM ADDRESSED: _____

_____

_____

_____

TYPE OF CRASHES: I.e. Right Angle, Read End, Obstruction, etc.

CRASH SUMMARY: (*Records & Diagrams MUST Be Attached*)

RECORD PERIOD (Yrs)	TOTAL	PROP DMG	INJURY	FATAL

PRELIMINARY COSTS:	**DESIGN**	**R-O-W**	**UTILITIES**	**CONST**

TOTAL PRELIMINARY COST: $0

ADDITIONALLY, PROVIDE HES PROJECT SCOPE/CORRECTIVE MEASURES WORKSHEET

C. O. CALCULATION OF BENEFIT COST RATIO: _____

C. O. COMMENTS: _____

_____

_____

HAS PROJECT PREVIOUSLY BEEN INVESTIGATED BY HIGH ACCIDENT TRAFFIC TEAM?

FINAL ESTIMATED COSTS:	**DESIGN**	**R-O-W**	**UTILITIES**	**CONST**

FINAL TOTAL ESTIMATED COSTS: $0

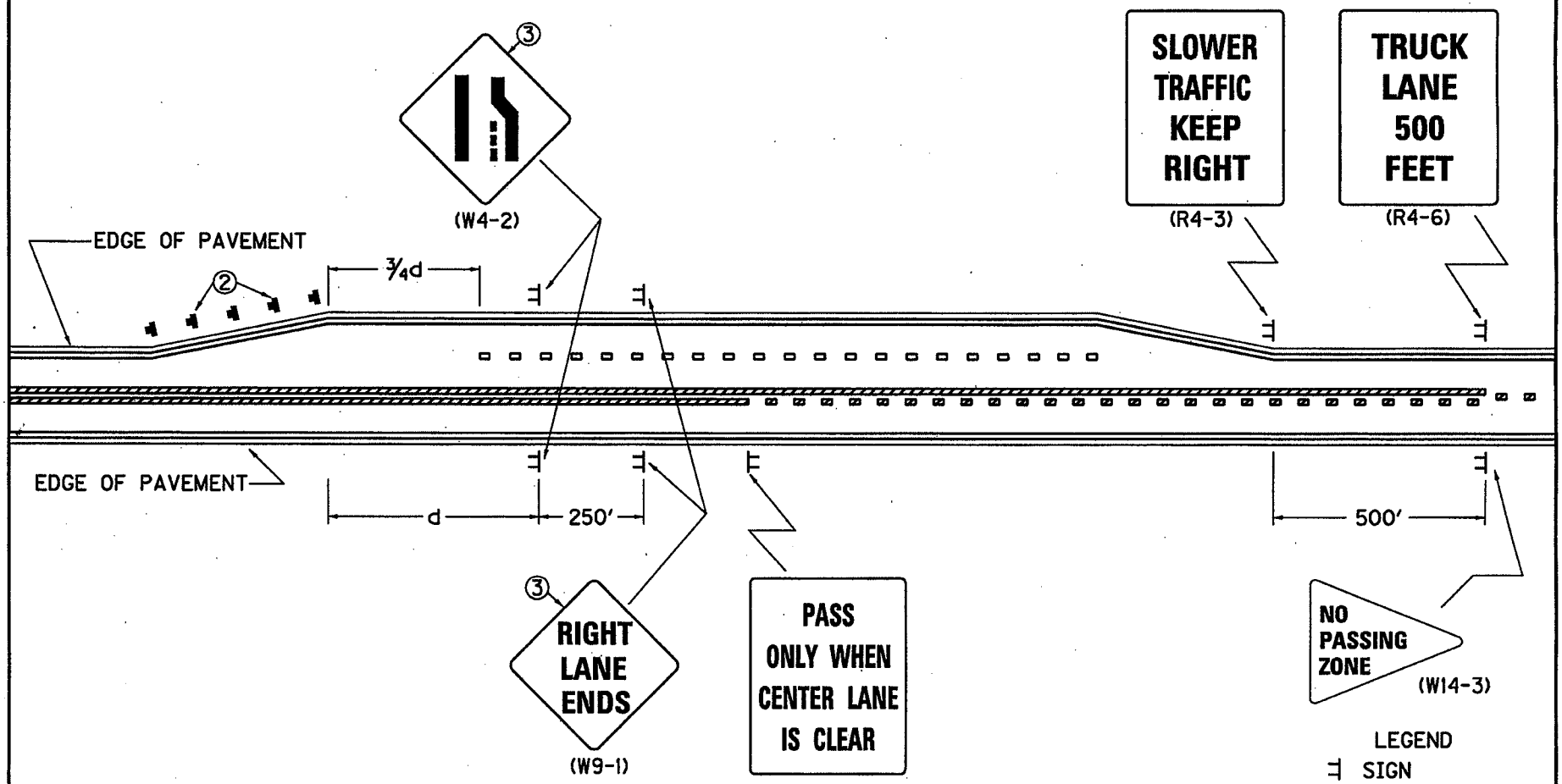
PRIORITY OF THIS PROJECT IN DISTRICT: _____

HES PROJECT SCOPE/CORRECTIVE MEASURES WORKSHEET

DISTRICT:		**COUNTY:**	
ROUTE:		**MILEPOST:**	**to**
CORRECTIVE MEASURES / LOCATION			
INTERSECTION APPROACH:			
SPOT LOCATION:			
	Signal		Sig Phasing
Electrical Device:	Beacon		Lighting
Raised Pavement Markers			
Median:	Existing		Proposed
Channelization:	Left Turn		Right Turn
	TWLTL		
Shoulder:	Existing		Proposed
	Widening	From	To
Pavement:	Resurface		Grooving
	Widening	From	To
	Superelevation:		
Milled Rumble Strips	Centerline		Shoulder
Guardrail:			
Flatten Slopes:			
Realignment	Horizontal		Vertical
	Hor/Vert		Realign
	Increase Turn Radii:		
Modify Entrance/Exit Ramp:			
Bridge Correction:	Replace		Widen
Add Sidewalk:			Eliminate Parking:
Traffic Signs	Warning		Regulatory
Glare Screen:			
Install Animal Fencing:			
Impact Attenuator			
Drainage Improve:			
Right of Way Involvement			
Utilities Involvement			
Environmental Concerns			

DRAWING NOT TO SCALE

REV. 06/05



REFER TO SECTION TO-402-2 AND TO-503

1. REFER TO SECTION 2C.05 OF THE MUTCD FOR GUIDANCE ON ADVANCE WARNING SIGN PLACEMENT DISTANCE (d). CONDITION "A" SHALL BE USED WHEN USING TABLE 2C-4.

② PLACE DELINEATORS THRU ENTIRE LENGTH OF TAPER FOR LANE REDUCTION. REFER TO SECTION 3D.04 OF THE MUTCD FOR GUIDANCE ON THE SPACING OF DELINEATORS.

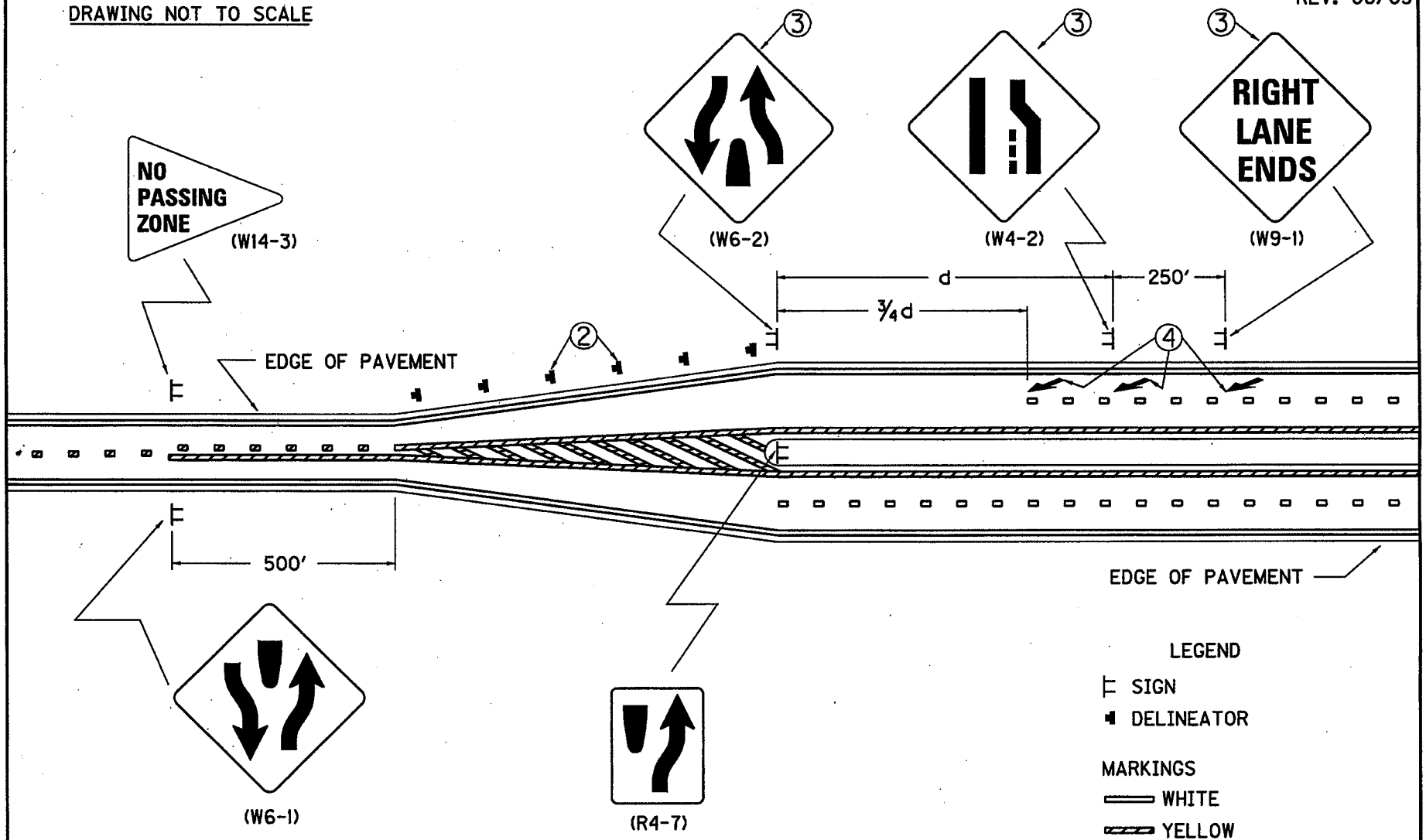
③ SIGNS W4-2 AND W9-1 SHALL BE DUAL-MOUNTED WHERE POSSIBLE.

EXHIBIT 5

TYPICAL TRUCK LANE SIGNING AND MARKINGS

REV. 06/05

DRAWING NOT TO SCALE



1. REFER TO SECTION 2C.05 OF THE MUTCD FOR GUIDANCE ON ADVANCE WARNING SIGN PLACEMENT DISTANCE (d). CONDITION 'A' SHALL BE USED WHEN USING TABLE 2C-4.

(2) PLACE DELINEATORS THRU ENTIRE LENGTH OF TAPER FOR LANE REDUCTION. REFER TO SECTION 3D.04 OF THE MUTCD FOR GUIDANCE ON THE SPACING OF DELINEATORS.

(3) SIGNS W6-2, W4-2, AND W9-1 SHALL BE DUAL MOUNTED WHERE MEDIAN WIDTH PERMITS.

(4) OPTIONAL (SEE SECTION TO-503)

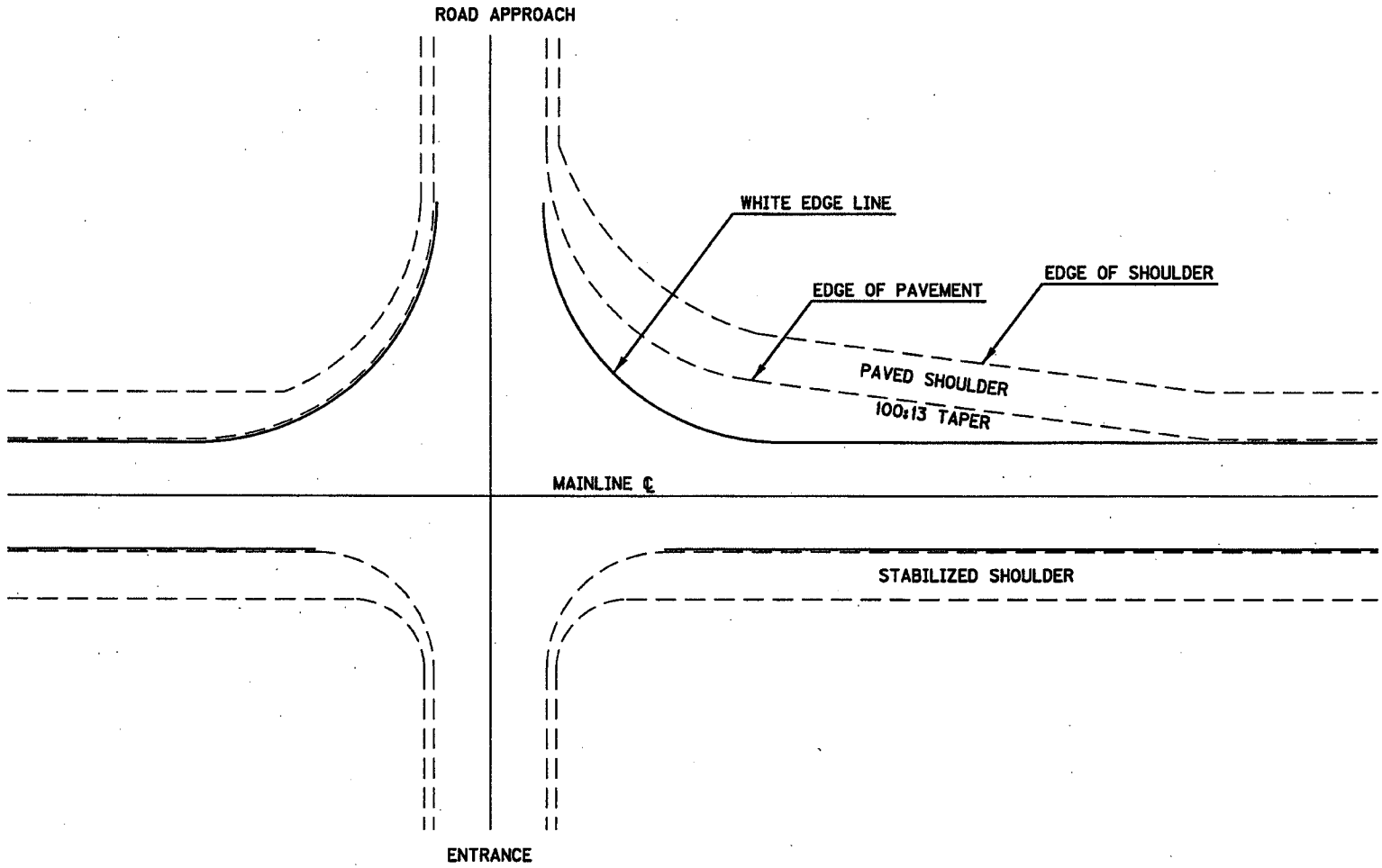
REFER TO SECTIONS TO-403-7 AND TO-503

EXHIBIT 6

TYPICAL TRANSITION SIGNING AND MARKINGS

DRAWING NOT TO SCALE

REV. 06/05

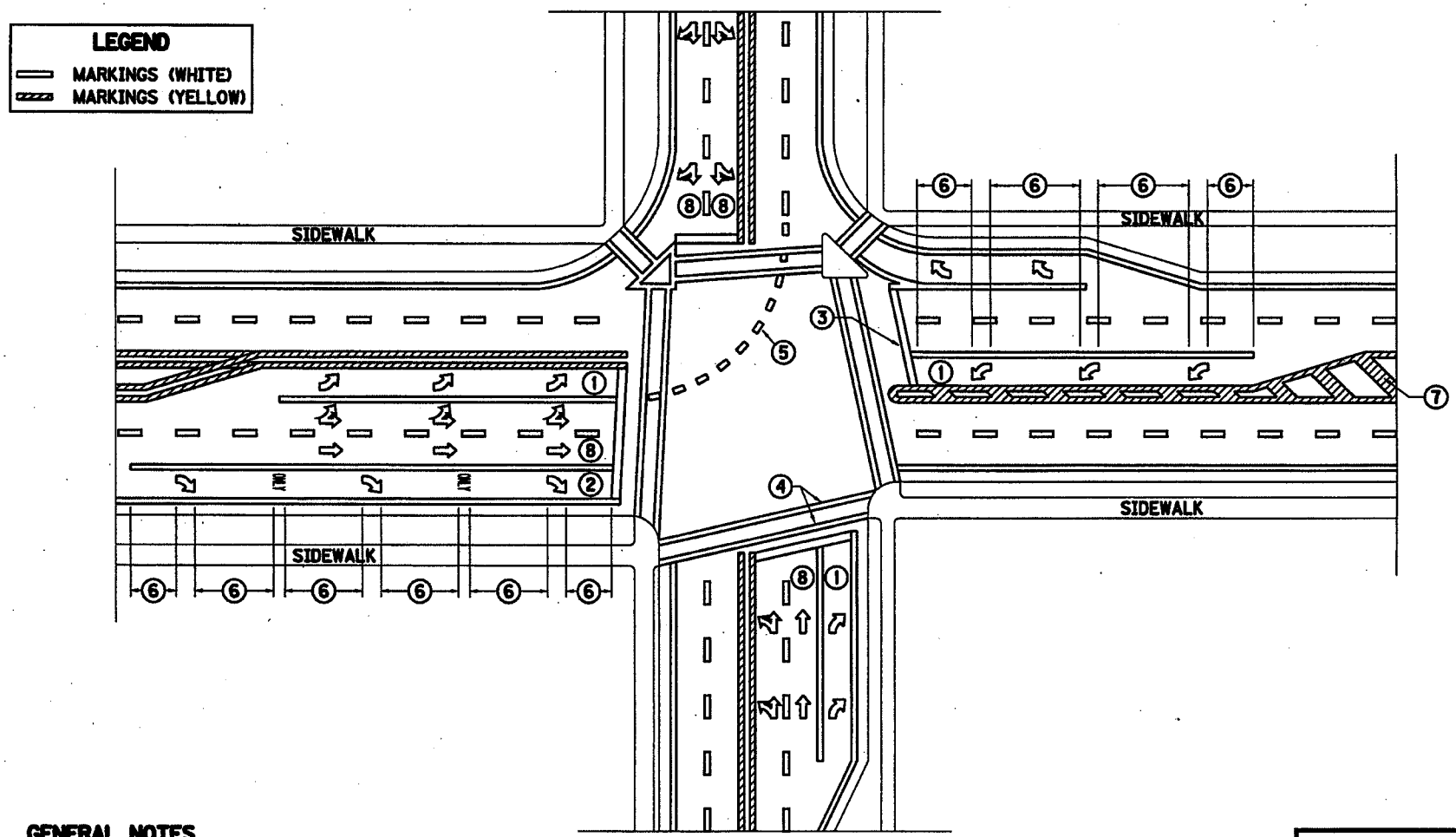


REFER TO SECTION TO-503

EXHIBIT 7

STRIPING OF 100:13
RIGHT-TURN TAPERS

REV. 06/05



GENERAL NOTES

REFER TO SECTION TO-504

1. LANE-USE ARROW MARKINGS SHALL BE USED IN RIGHT AND LEFT-TURN BAYS AT SIGNALIZED INTERSECTIONS.
2. LANE-USE ARROW MARKINGS SHALL BE USED FOR MANDATORY LANE-DROPS. THEY SHALL BE ACCOMPANIED THE WORD "ONLY".
3. STOP BARS SHALL BE SOLID WHITE AND EITHER 12" OR 24" WIDE. THEY SHOULD EXTEND ACROSS ALL APPROACH LANES AND SHOULD BE PLACED A MINIMUM OF 4' IN ADVANCE OF THE NEAREST CROSSWALK LINE. IN THE ABSENCE OF A MARKED CROSSWALK, STOP BARS SHOULD BE PLACED NO MORE THAN 30' OR LESS THAN 4' FROM THE NEAREST EDGE OF THE INTERSECTING ROADWAY.
4. CROSSWALK LINES SHALL BE SOLID WHITE. THEY SHALL BE EITHER 6" OR 12" IN WIDTH AND SHOULD NOT BE SPACED LESS THAN 6' APART. BOTH LINES SHOULD EXTEND ACROSS THE FULL WIDTH OF THE APPROACH PAVEMENT.
5. DOTTED LINE EXTENSIONS SHALL BE THE SAME COLOR AND WIDTH AS THE LINE THEY EXTEND AND SHOULD CONSIST OF SEGMENTS 3' IN LENGTH AND GAPS OF 6'.
6. SPACING BETWEEN SYMBOLS AND LEGENDS SHALL BE NO MORE THAN 80' OR LESS THAN 32'. SPACING SHOULD BE SELECTED TO MINIMIZE THE NUMBER OF SYMBOLS AND LEGENDS PER LANE.
7. WIDTH AND SPACING OF CROSS-HATCHING SHALL BE AS SHOWN IN PLANS OR AS DIRECTED BY THE ENGINEER.
8. ARROWS IN THIS LANE ARE OPTIONAL.
9. SOME ASPECTS OF THIS DRAWING MAY ALSO APPLY TO NON-SIGNALIZED INTERSECTIONS.

DRAWING NOT TO SCALE

EXHIBIT 8
TYPICAL MARKINGS AT SIGNALIZED INTERSECTIONS

Raised Pavement Marker System

DISTRICT 1

ROUTE		BEGIN MP	END MP
		BALLARD	
US	51	0.000	8.297
US	60	0.000	16.937
KY	121	0.000	8.689
KY	286	0.000	14.415
		CALLOWAY	
US	641	0.000	17.444
KY	121	0.000	24.156
		CARLISLE	
US	51	0.000	12.655
KY	121	0.000	9.714
		CRITTENDEN	
US	60	0.000	23.018
US	641	0.000	7.494
		FULTON	
JC	9003	0.000	3.412
US	51	0.000	4.682
		GRAVES	
JC	9003	8.352	34.487
US	45	17.219	17.952
US	45	19.045	31.580
KY	58	5.530	14.881
KY	80	9.742	11.461
KY	121	0.000	23.975
		HICKMAN	
JC	9003	3.434	8.352
US	51	0.000	15.095
		LIVINGSTON	
I	24	29.352	33.880
US	60	0.000	29.059
US	62	0.000	2.854
		LYON	
I	24	33.880	54.842
WK	9001	0.000	5.610
US	62	0.000	10.465
US	641	0.000	5.715

Raised Pavement Marker System

DISTRICT 1 (cont.)

ROUTE		BEGIN MP	END MP
		McCRACKEN	
I	24	0.000	17.320
US	45	0.000	10.806
US	45X	2.119	2.946
US	60	0.000	19.830
US	60X	0.000	5.065
US	62	3.269	15.513
US	68	0.000	2.677
KY	286	0.000	2.281
		MARSHALL	
I	24	17.320	29.352
JC	9003	34.487	52.333
US	62	8.816	12.081
US	68	0.000	28.146
US	641	0.000	19.250
US	641S	0.000	3.519
KY	58	0.000	2.156
KY	402	0.000	16.859
		TRIGG	
I	24	57.389	69.830
US	68	0.000	28.115

Total Miles for District 1 =	**539.246**

Raised Pavement Marker System

DISTRICT 2

ROUTE		BEGIN MP	END MP
		CALDWELL	
I	24	54.842	57.389
WK	9001	5.610	21.764
US	641	0.000	4.629
		CHRISTIAN	
I	24	69.830	93.373
EB	9004	7.000	28.095
US	41	0.000	10.395
US	41	11.909	12.441
US	41A	0.000	13.516
US	68	0.000	21.114
KY	380	0.000	3.613
KY	1682	0.000	4.979
		DAVIESS	
AU	9005	15.883	23.441
WN	9007	59.473	70.184
US	60	0.000	28.288
US	60B	0.000	10.212
US	431	0.000	14.670
KY	54	0.000	2.554
KY	81	11.860	14.493
KY	2121	0.000	1.780
KY	2155	0.000	4.427
		HANCOCK	
US	60	0.000	17.696
		HENDERSON	
EB	9004	65.305	78.306
AU	9005	0.000	15.883
US	41	0.000	12.888
US	41	13.641	21.041
US	41A	0.000	17.397
US	60	0.000	10.435
US	60	10.608	25.345
KY	425	0.000	5.528

Raised Pavement Marker System

DISTRICT 2 (cont.)

ROUTE		BEGIN MP	END MP
		HOPKINS	
WK	9001	21.764	43.424
EB	9004	28.095	55.003
US	41	12.083	27.705
US	41A	0.000	13.278
KY	281	0.000	0.712
		MCLEAN	
US	431	0.000	11.573
		MUHLENBERG	
WK	9001	43.424	65.675
US	62	8.780	12.729
US	62	14.667	17.930
US	431	0.000	27.779
KY	176	0.000	7.930
KY	189	8.750	17.748
		OHIO	
WK	9001	65.675	87.544
WN	9007	35.063	59.473
		UNION	
US	60	0.000	26.069
KY	56	0.000	13.480
KY	109	0.000	1.536
		WEBSTER	
EB	9004	55.003	65.305
US	41	0.000	12.226
US	41A	0.000	19.657
KY	109	2.876	14.664
KY	670	0.000	2.712

Total Miles for District 2 =	**627.887**

Raised Pavement Marker System

DISTRICT 3

ROUTE		BEGIN MP	END MP
		ALLEN	
US	31E	0.000	19.189
US	231	1.100	8.875
		BARREN	
I	65	42.890	43.307
I	65	45.935	53.956
LN	9008	0.000	22.357
US	31E	0.000	25.857
US	31EX	1.461	1.516
US	68	11.741	12.650
KY	63	2.327	14.569
KY	70	5.178	5.359
KY	90	0.000	22.022
		BUTLER	
WK	9001	87.544	88.433
WN	9007	18.166	35.063
US	231	0.000	8.228
		EDMONSON	
I	65	43.307	45.935
KY	70	9.939	12.388
KY	101	0.000	4.180
KY	259	9.242	22.277
KY	728	0.000	12.017
		LOGAN	
US	68	0.000	29.223
US	79	0.000	12.135
US	431	0.000	31.050
		METCALFE	
LN	9008	22.357	36.159
KY	90	0.000	11.719
		MONROE	
KY	163	0.000	8.530
		SIMPSON	
I	65	0.000	13.711
US	31W	0.000	13.984
KY	73	7.169	9.234
KY	100	9.675	10.648

Raised Pavement Marker System

DISTRICT 3 (cont.)

ROUTE		BEGIN MP	END MP
		TODD	
US	41	0.000	12.458
US	68	0.000	14.422
US	68X	0.000	4.786
US	79	0.000	10.606
		WARREN	
I	65	13.711	42.890
WN	9007	0.000	18.166
US	31W	0.000	17.471
US	31W	27.869	28.794
US	68	0.000	13.060
US	231	0.000	15.510
US	231X	0.000	3.889
KY	101	7.865	12.850
KY	446	0.000	0.970
KY	880	0.000	3.646

Total Miles for District 3 =	**466.613**

Raised Pavement Marker System

DISTRICT 4

ROUTE		BEGIN MP	END MP
BRECKINRIDGE			
US	60	0.000	31.811
KY	79	5.294	14.990
KY	259	0.000	7.901
GRAYSON			
WK	9001	88.433	119.649
US	62	20.787	21.296
KY	259	0.000	21.459
GREEN			
US	68	11.954	18.411
KY	61	0.000	24.344
HARDIN			
I	65	78.661	103.308
WK	9001	119.649	136.796
BG	9002	0.000	8.837
US	31W	0.000	37.367
US	31WB	0.000	3.758
US	62	14.580	17.500
KY	61	0.000	5.309
KY	313	0.000	11.987
KY	3005	0.000	8.674
HART			
I	65	53.956	74.622
US	31E	0.000	21.575
LARUE			
I	65	74.622	78.661
US	31E	0.000	20.651
KY	61	0.000	13.603
MARION			
US	68	0.000	10.698
KY	49	17.621	17.774
KY	55	0.000	4.669
MEADE			
US	31W	0.000	3.530
US	60	0.000	14.944
KY	79	8.237	9.912
KY	144	25.496	28.771
KY	448	0.000	4.392
KY	1051	0.000	2.218

Raised Pavement Marker System

DISTRICT 4 (cont.)

ROUTE		BEGIN MP	END MP
		NELSON	
BG	9002	8.837	39.267
US	31E	0.000	27.310
US	62	14.294	14.653
US	62	24.989	27.286
US	150	0.000	7.682
KY	55	3.085	6.975
KY	245	0.000	12.597
		TAYLOR	
US	68	0.000	13.531
KY	55	0.000	10.293
		WASHINGTON	
BG	9002	39.267	44.807
US	150	0.000	20.892
KY	55	0.000	4.551
KY	555	0.000	14.738

Total Miles for District 4 =	**534.237**

Raised Pavement Marker System

DISTRICT 5

ROUTE		BEGIN MP	END MP
		BULLITT	
I	65	103.308	123.180
US	31E	0.000	5.162
KY	44	0.000	22.999
KY	245	0.000	6.805
		FRANKLIN	
I	64	46.303	59.431
US	60	10.667	14.038
US	127	0.000	21.400
US	421	0.000	17.886
US	460	0.000	6.114
KY	151	0.000	2.141
KY	676	0.000	5.287
		HENRY	
I	71	24.727	38.086
US	42	0.000	1.122
US	421	0.000	24.973
KY	22	7.420	7.522
KY	55	0.000	4.490
		JEFFERSON	
I	64	0.000	23.974
I	65	123.180	137.318
I	71	0.000	11.315
I	264	0.000	22.927
I	265	10.236	34.727
US	31E	0.000	12.031
US	31W	0.000	14.776
US	42	5.779	11.835
US	60	3.543	17.375
KY	22	0.438	6.517
KY	146	7.000	8.825
KY	155	0.000	6.889
KY	841	0.000	10.250
KY	841	34.727	37.006
KY	1934	2.301	9.894

Raised Pavement Marker System

DISTRICT 5 (cont.)

ROUTE		BEGIN MP	END MP
		OLDHAM	
I	71	11.315	24.727
US	42	0.000	19.359
KY	22	3.505	3.544
KY	146	0.000	6.073
		SHELBY	
I	64	23.974	46.303
US	60	8.324	11.398
US	421	0.000	0.790
KY	53	6.085	19.609
KY	55	0.000	17.825
		SPENCER	
US	31E	0.000	2.741
KY	44	8.451	8.997
KY	55	0.000	13.566
KY	155	0.000	4.247
		TRIMBLE	
I	71	38.086	38.808
US	42	0.000	14.520
US	421	0.000	19.287

Total Miles for District 5 =	**498.720**

Raised Pavement Marker System

DISTRICT 6

ROUTE		BEGIN MP	END MP
		BOONE	
I	71	69.890	77.724
I	75	169.439	183.312
I	275	1.582	13.858
		BRACKEN	
KY	9	0.000	19.857
		CAMPBELL	
I	275	73.061	77.579
I	471	0.000	5.016
US	27	0.000	22.208
KY	9	0.000	17.978
KY	1120	1.960	3.503
KY	1998	1.738	3.939
		CARROLL	
I	71	38.808	53.433
US	42	9.574	16.500
		GALLATIN	
I	71	53.433	69.890
US	42	0.000	1.600
		GRANT	
I	75	143.239	166.263
		HARRISON	
US	27	0.000	19.416
KY	353	0.000	2.331
		KENTON	
I	75	166.263	169.439
I	75	183.312	191.777
I	275	0.000	1.582
I	275	77.579	83.780
KY	16	13.786	16.666
		PENDLETON	
US	27	0.000	19.340
KY	9	0.000	4.339
		ROBERTSON	
US	68	0.000	1.357

Total Miles for District 6 =	**239.023**

Raised Pavement Marker System

DISTRICT 7

ROUTE		BEGIN MP	END MP
		ANDERSON	
BG	9002	44.807	52.315
BG	9002	56.287	61.947
US	127	0.000	2.535
US	127	8.897	11.120
US	127B	0.000	6.656
KY	151	0.000	4.587
		BOURBON	
US	27	0.000	15.435
US	68	0.000	10.814
US	68X	0.000	2.772
US	460	0.000	21.933
KY	353	0.000	6.496
KY	627	0.000	9.276
		BOYLE	
US	68	6.390	6.499
US	127	0.000	5.428
US	127	8.083	10.319
US	127B	0.000	5.270
US	150	0.000	18.766
US	150B	0.000	2.272
KY	34	13.629	18.993
KY	52	0.000	5.114
		CLARK	
I	64	89.480	104.260
KY	9000	0.000	11.913
KY	627	0.000	6.383
KY	627	9.592	15.017
KY	1958	0.000	2.751

Raised Pavement Marker System

DISTRICT 7 (cont.)

ROUTE		BEGIN MP	END MP
		FAYETTE	
I	64	71.000	74.729
I	64	81.037	89.480
I	75	97.543	120.792
US	25	8.244	15.133
US	27	0.000	2.412
US	27	8.450	15.767
US	60	0.000	8.162
US	68	0.000	3.110
US	421	0.000	1.798
KY	4	0.000	19.283
KY	353	0.000	11.113
KY	418	0.000	2.520
KY	922	0.000	2.860
		GARRARD	
US	27	0.000	16.417
KY	34	0.000	1.610
KY	52	0.000	16.624
KY	1295	0.000	6.972
		JESSAMINE	
US	27	0.000	15.278
US	68	0.000	12.008
		MADISON	
I	75	73.408	97.543
US	25	2.863	3.810
US	25	12.027	20.255
US	421	0.000	12.445
KY	21	0.000	14.196
KY	52	0.000	0.202
KY	52	5.444	10.910
KY	52	12.970	22.869
KY	627	0.000	6.074
KY	876	7.166	9.998
KY	1295	0.000	4.529
		MERCER	
BG	9002	52.315	56.287
US	68	6.752	20.104
US	127	0.000	17.150

Raised Pavement Marker System

DISTRICT 7 (cont.)

ROUTE		BEGIN MP	END MP
		MONTGOMERY	
I	64	104.260	115.647
US	460	0.000	22.151
KY	686	0.000	3.506
		SCOTT	
I	64	67.106	71.000
I	75	120.792	143.239
US	62	6.000	10.641
US	460	0.000	17.658
US	460B	0.000	1.026
		WOODFORD	
I	64	59.431	67.106
BG	9002	61.947	71.134
US	60	0.000	13.039

Total Miles for District 7 =	**591.538**

EXHIBIT 9

Raised Pavement Marker System

DISTRICT 8

ROUTE		BEGIN MP	END MP
		ADAIR	
LN	9008	36.159	57.791
KY	55	10.059	18.909
KY	61	13.402	21.935
KY	80	11.775	22.058
		CASEY	
US	127	0.000	23.715
KY	80	0.000	5.144
		CLINTON	
US	127	0.000	20.967
KY	90	0.000	12.816
		CUMBERLAND	
KY	61	0.000	13.701
KY	90	0.000	22.450
		LINCOLN	
US	27	0.000	21.982
US	127	0.000	10.686
US	150	0.000	18.680
		McCREARY	
US	27	0.000	22.252
KY	90	0.000	11.920
		PULASKI	
LN	9008	72.087	88.547
US	27	0.000	30.693
KY	80	0.000	17.794
KY	80	21.579	40.100
KY	80B	0.000	2.315
KY	90	0.000	4.169
KY	461	0.000	8.441
KY	1225	0.000	0.256
		ROCKCASTLE	
I	75	50.767	73.408
US	25	0.000	16.000
US	150	0.000	10.511
US	421	0.000	0.483
KY	461	0.000	9.404

Raised Pavement Marker System

DISTRICT 8 (cont.)

ROUTE		BEGIN MP	END MP
RUSSELL			
LN	9008	57.791	72.087
US	127	0.000	26.927
KY	76	7.445	7.985
KY	80	0.000	10.564
WAYNE			
KY	90	0.000	25.235

Total Miles for District 8 =	**468.861**

Raised Pavement Marker System

DISTRICT 9

ROUTE		BEGIN MP	END MP
BATH			
I	64	115.647	128.955
BOYD			
I	64	180.812	191.507
US	23	0.000	21.042
US	60	4.023	12.360
KY	180	0.800	2.518
CARTER			
I	64	148.665	180.812
KY	1	4.134	12.804
KY	7	0.000	10.865
KY	9	0.000	18.262
ELLIOTT			
KY	7	0.000	18.890
FLEMING			
US	68	0.000	5.423
KY	11	10.630	17.105
KY	32	10.612	28.293
GREENUP			
US	23	0.000	28.760
KY	1	0.000	17.336
KY	10	0.000	11.582
LEWIS			
KY	9	0.000	31.218
KY	10	6.788	19.834
MASON			
US	62	12.672	16.526
US	62 X	0.000	3.634
US	68	0.000	11.854
KY	9	0.000	17.402
KY	11	0.000	11.225
NICHOLAS			
US	68	0.000	12.132

Raised Pavement Marker System

DISTRICT 9 (cont.)

ROUTE		BEGIN MP	END MP
		ROWAN	
I	64	128.955	148.665
KY	32	0.000	8.429

Total Miles for District 9 =	**363.695**

Raised Pavement Marker System

DISTRICT 10

ROUTE		BEGIN MP	END MP
BREATHITT			
KY	15	0.000	27.505
KY	52	0.000	9.674
ESTILL			
KY	52	0.000	7.588
KY	82	0.000	5.029
KY	89	11.372	17.903
LEE			
KY	11	0.000	14.845
KY	52	0.000	24.524
MAGOFFIN			
KY	9009	63.084	75.627
US	460	0.000	20.426
KY	114	0.000	5.026
MENIFEE			
US	460	0.000	19.386
MORGAN			
KY	9009	57.681	63.084
US	460	0.000	28.691
KY	7	0.000	11.378
KY	203	0.000	3.761
OWSLEY			
KY	11	14.343	17.444
KY	30	0.000	11.146
PERRY			
DB	9006	51.026	59.088
KY	15	0.000	25.179
KY	80	7.910	15.862
POWELL			
KY	9000	11.913	36.000
KY	11	0.000	3.504
KY	15	4.083	4.157
KY	82	0.000	2.058

Raised Pavement Marker System

DISTRICT 10 (cont.)

ROUTE		BEGIN MP	END MP
		WOLFE	
KY	9000	36.000	43.104
KY	9009	43.104	57.681
KY	11	0.000	5.317
KY	15	0.000	9.515
KY	15S	0.000	1.054
KY	191	0.000	10.317
KY	203	0.000	1.323

Total Miles for District 10 =	**336.680**

EXHIBIT 9

Raised Pavement Marker System

DISTRICT 11

ROUTE		BEGIN MP	END MP
		BELL	
US	25E	0.000	18.651
US	119	0.000	15.880
		CLAY	
DB	9006	10.593	35.929
US	421	0.000	32.841
KY	80	7.301	7.537
		HARLAN	
US	119	0.000	39.182
US	421	0.000	27.632
		JACKSON	
US	421	0.000	29.585
KY	30	0.000	20.919
		KNOX	
US	25E	0.000	26.197
		LAUREL	
I	75	27.943	50.767
DB	9006	0.000	10.593
US	25	13.556	16.379
US	25E	0.000	2.024
KY	30	1.356	9.781
KY	80	0.000	24.697
KY	192	18.243	22.041
KY	490	0.000	1.021
		LESLIE	
DB	9006	35.929	51.026
US	421	0.000	22.513
KY	118	0.000	3.524
		WHITLEY	
I	75	0.000	27.943
US	25W	22.183	29.610
KY	90	0.000	8.328

Total Miles for District 11 =	**397.496**

Raised Pavement Marker System

DISTRICT 12

ROUTE		BEGIN MP	END MP
FLOYD			
US	23	0.000	21.878
KY	80	0.000	14.435
KY	114	0.000	11.425
JOHNSON			
US	23	0.000	16.938
US	460	0.000	7.809
KY	40	8.741	23.439
KNOTT			
KY	15	0.000	9.380
KY	80	0.000	20.093
KY	160	0.000	12.468
LAWRENCE			
US	23	0.000	29.069
KY	645	0.000	5.205
LETCHER			
US	23	0.000	7.319
US	119	0.000	28.225
KY	7	13.497	14.157
KY	15	0.000	10.675
MARTIN			
KY	3	11.245	11.405
KY	40	0.000	20.280
KY	645	0.000	4.682
PIKE			
US	23	0.000	32.828
US	119	0.000	27.542
US	460	0.000	25.345
KY	80	0.000	6.941
KY	1426	6.602	9.636
KY	1460	0.000	7.112

Total Miles for District 12 =	**338.201**

TRANSPORTATION CABINET
DIVISION OF TRAFFIC OPERATIONS

TRAFFIC SIGNAL CHECKLIST

DATE _____ COUNTY _____ CITY _____

INTERSECTION _____ MILEPOINT _____

NEW INSTALLATION ☐ APPROVAL DATE _____ COMPLETION DATE _____
REVISION ☐ PLANS COMPLETED _____ TURN-ON DATE _____
REMOVAL ☐ FIELD ASSIGNED _____ TURN-ON TIME _____
UPDATE ☐

TYPE OF DEVICE

☐ SIGNAL
- ☐ FIXED TIME
- ☐ SEMI-ACTUATED
- ☐ FULLY ACTUATED
- ☐ PEDESTRIAN

☐ SCHOOL FLASHER
- _____ SPEED WHEN FLASHING
- _____ OVERHEAD
- _____ SIDE MOUNTED

☐ INTERSECTION BEACON

☐ SIGN BEACON
_____ SIGN

OPERATIONAL DETAILS

NUMBER OF PHASES _____

PROT/PERM PHASES _____

GES Y☐ N☐
ON PHASES _____

ADVANCED WARNING FLASHER Y☐ N☐
ON PHASES _____
DISTANCE FROM STOPBAR _____
ADVANCE WARNING TIME _____

RAILROAD PREEMPTION Y☐ N☐
ON PHASES _____

EMERGENCY PREEMPT Y☐ N☐

SIGNAL INDICATIONS

MAINLINE, APPROACH NAME _____ SPEED _____

____ 8"R – 8"Y – 8"G	____ 8" BEACON	____ RED	____ YELLOW	
____ 12"R – 8"Y – 8"G	____ 12" BEACON	____ RED	____ YELLOW	
____ 12"R – 12"Y – 12"G	____ WALK/DON'T WALK	____ 9"	____ 12"	____ 16"
____ BACKPLATES	____ PED BUTTONS			____ ACCESSIBLE
____ OTHER _____				

SIDE STREET, APPROACH NAME _____ SPEED _____

____ 8"R – 8"Y – 8"G	____ 8" BEACON	____ RED	____ YELLOW	
____ 12"R – 8"Y – 8"G	____ 12" BEACON	____ RED	____ YELLOW	
____ 12"R – 12"Y – 12"G	____ WALK/DON'T WALK	____ 9"	____ 12"	____ 16"
____ BACKPLATES	____ PED BUTTONS			____ ACCESSIBLE
____ OTHER _____				

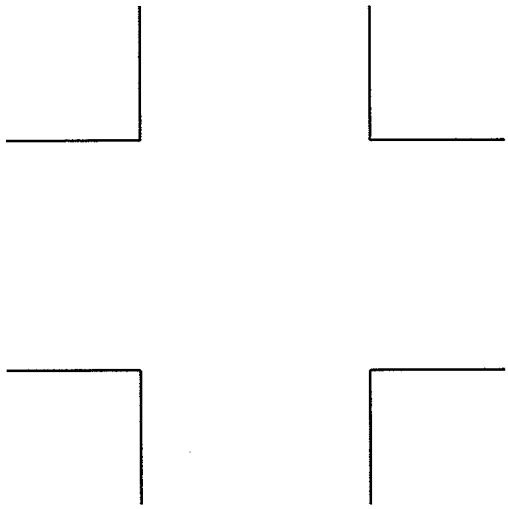
DETECTION

	TYPE (VID/LOOP)	SIZE	DISTANCE FROM STOP BAR	DELAY TIME	
MAINLINE THROUGH	_____	_____	_____	_____	SEC
MAINLINE LEFT TURN	_____	_____	_____	_____	SEC
SIDE STREET	_____	_____	_____	_____	SEC

GES LOOPS
NEAR LOOP _____ FEET FROM STOP BAR FAR LOOP _____ FEET FROM STOP BAR
CRITICAL GRADE _____ % VEHICLE INTERVAL _____ SECONDS

PHASE FUNCTIONS (0 + key)

FUNCTION	KEY	PHASE NUMBER (use cad lights) 1	2	3	4	5	6	7	8
VEHICLE RECALL	0								
PED RECALL	1								
RED LOCK	2								
YELLOW LOCK	3								
PERMIT	4								
PED PHASES	5								
LEAD PHASES	6								
DOUBLE ENTRY	7								
SEQUENTIAL TIMING	8								
START UP GREEN	9								
OVERLAP A	A								
OVERLAP B	B								
OVERLAP C	C								
OVERLAP D	D								
EXCLUSIVE PHASE	E								
SIMULTANEOUS GAP	F								



PHASE TIMING (phase + key)

FUNCTION	KEY	PHASE 1	2	3	4	5	6	7	8
MAX I	0								
MAX II	1								
WALK	2								
FLASH DON'T WALK	3								
MAX INITIAL	4								
MINIMUM GREEN	5								
TIME BEFORE REDUCTION	6								
TIME TO REDUCE	7								
OBSERVE GAP (read only)	8								
PASSAGE	9								
MINIMUM GAP	A								
ADDED PER ACTUATION	B								
YELLOW	C								
RED CLEARANCE	D								
RED REVERT	E								
WALK II	F								

FLASH COLOR	R Y	R Y	R Y	R Y	R Y	R Y	R Y	R Y

EXHIBIT 11

TC 72-8, Rev. 06/05

KENTUCKY TRANSPORTATION CABINET

TRAFFIC SIGNAL WARRANT ANALYSIS

COUNTY _____ DATE _____ DAY OF WEEK _____

CITY _____ MILEPOST _____ NO. OF CORRECTIBLE CRASHES IN 12 MONTH PERIOD _____

MAJOR STREET NAME _____ NO. OF MAJOR STREET APPROACH LANES _____

MINOR STREET NAME _____ NO. OF MINOR STREET APPROACH LANES _____

POSTED SPEED LIMIT MAJOR SREET _____ MPH

POSTED SPEED LIMIT MINOR SREET _____ MPH

POPULATION < 10,000 ☐ YES ☐ NO

REDUCED WARRANTS BASED UPON ☐ SPEED ☐ POPULATION

TIME	MAJOR STREET TWO WAY VOLUME	MINOR STREET HIGHEST VOLUME APPROACH	WARRANT 1 CONDITION A		WARRANT 1 CONDITION B		WARRANT 1 - Condition A and B Combined (Warrant 1 Condition A and B 80% Satisfied)			
			Minimum Vehicular Volume		Interruption of Continuous Traffic		Warrant 1 Condition A - 80%		Warrant 1 Condition B - 80%	
			MAJOR	MINOR	MAJOR	MINOR	MAJOR	MINOR	MAJOR	MINOR
			500 (1)	150 (1)	750 (1)	75 (1)	400 (1)	120 (1)	600 (1)	60 (1)
			600 (2)	200 (2)	900 (2)	100 (2)	480 (2)	160 (2)	720 (2)	80 (2)
			REDUCED WARRANTS				Warrant 7 - CRASH EXPERIENCE			
			350 (1)	105 (1)	525 (1)	53 (1)	(Warrant 1 Condition A or B 80% Satisfied) and			
			420 (2)	140 (2)	630 (2)	70 (2)	(5 or More Correctible Crashes in 12 Month Period)			
			(1) = ONE LANE APPROACH				(2) = TWO LANE APPROACH			
7-8 am										
8-9 am										
9-10 am										
10-11 am										
11-12 am										
12-1 pm										
1-2 pm										
2-3 pm										
3-4 pm										
4-5 pm										
5-6 pm										
6-7 pm										
NUMBER OF HOURS										
COMPLIANCE										

EXHIBIT 12

SCHOOL FLASHER FORM

COUNTY_____

ROUTE_____

SCHOOL_____

I, the undersigned school official, request the Kentucky Transportation Cabinet to install a school speed zone with school flasher assemblies at the above location.

SIGNATURE_____

TITLE_____

DATE_____

Convening and dismissal times for the school are:

CONVENING TIME_____

DISMISSAL TIME_____

Please return to the following address:

Fax:

To be filled out by the Kentucky Transportation Cabinet:

Operating times (morning):

Operating times (afternoon):

General Phasing Diagram

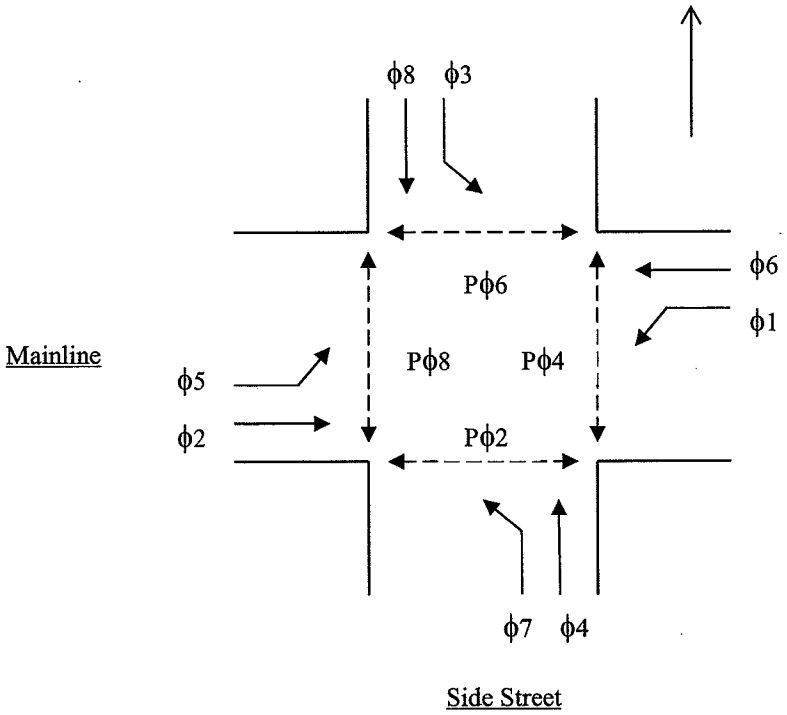


EXHIBIT 14

Advance Warning Flasher Checklist

Location Information

County _____
Route _____
Intersecting Route _____
Milepoint _____
Date of Study _____
Conducted By _____

NOTE: Shaded cells cannot be edited.

☐ **Right Angle Crash Data**

Total number of crashes at location = _____
Total number of crashes classified as "ANGLE" =
Percentage of angle crashes at location =

Evaluation factor is satisfied if percentage is greater or equal to 50%.

☐ **Critical Rate Analysis**

Total number of crashes at location = _____
Date range of CRASH query = _____ to _____
Statewide average crash rate =
Critical Rate Factor =

Evaluation factor is satisfied if Critical Rate Factor is greater than or equal to 1.0.

☐ **Speed Limit**

Posted speed limit = _____

Evaluation factor is satisfied if posted speed limit (or 85th percentile speed) is 45 MPH or greater.

☐ **Truck Information**

Is this location on the Extended Weight Coal Haul System? _____

☐ **Sight Distance**

Approximate sight distance to the traffic signal heads (ft) = _____

Evaluation factor is satisfied if sight distance to the signal heads is restricted to 700 feet or less.

☐ **Grade**

Approximate approach grade to the intersection = _____

Evaluation factor is satisfied if the approach grade is steeper than 4%.

☐ **Red Light Violation Rate**

Percentage of red light violations vs. signal cycles = _____

Evaluation factor is satisfied if the red light violation rate is greater than or equal to 12% of the observed signal cycles.

☐ **Adjacent Bridge Deck**

Would a nearby bridge deck interfere with GES loops? _____

Evaluation factor is satisfied if GES loops cannot be installed at a signalized intersection due to a nearby bridge deck.

Other Information

If signalized and equipped with GES capability, does the GES "max out" on a substantial number of signal cycles? _____

What is the percentage of trucks? _____

WARNING!

HIGHWAY-RAIL GRADE CROSSING WARNING SYSTEM AND HIGHWAY TRAFFIC SIGNALS ARE INTERCONNECTED

BEFORE MODIFICATION is made to any operation which connects to or controls the timing of an active railroad warning system and/or timing and phasing of a traffic signal, the appropriate party(ies) shall be notified and, if necessary, a joint inspection conducted.

Intersection: _____
U.S. DOT/AAR Crossing Number: _____

Highway Agency: _____
Contact Name: _____
Phone Number: _____

Railroad: _____
Contact Name: _____
Phone Number: _____

EXHIBIT 16

THIS AGREEMENT, made as of the _____ day of _____, 20___, by and between KENTUCKY POWER COMPANY, a Kentucky corporation, (herein called "Owner") and the TRANSPORTATION CABINET, STATE OF KENTUCKY, (herein called "Licensee"),

WITNESSETH,
THAT:

WHEREAS, Owner operates and maintains an electric distributing system consisting of various pole lines extending in and through the Commonwealth of Kentucky, some of which are located on state owned right-of-way, and

WHEREAS, certain wires and/or other attachments, herein collectively called attachments, owned by Licensee, are attached or are to be attached to those certain poles of Owner, more specifically identified on the Pole Attachment Permit signed by Owner and Licensee and attached hereto as part hereof, and

WHEREAS, permission to make additions to or changes in such attachment may be requested from time to time by Licensee and if granted such Permit, shall be revised to include such additions or changes and substituted in the place of the attached Permit or any prior revised Permit, and

WHEREAS, Owner is willing to permit Licensee to place and/or maintain such attachments on such poles under and subject to the conditions hereinafter set forth.

NOW, THEREFORE,

Owner, for and in the consideration of using state owned right-of-way does hereby license and permit Licensee to place and/or maintain the attachments described in the attached Pole Attachment Permit, or any revision thereof, on the poles of Owner identified therein. Such attachments are to be placed and/or maintained on such poles in the manner and upon the conditions hereinafter set forth, all of which Licensee accepts and agrees to abide by and perform, viz.:

1. Such attachments are to be placed and/or maintained on the poles of Owner in a manner satisfactory to Owner and so as not to interfere with the present and/or any future use which Owner may desire to make of such poles or wires attached thereto. Such attachments shall be installed and at all times maintained by Licensee strictly in accordance with the provisions of the National Electrical Code and/or any other applicable regulations or codes promulgated by state, local or other governmental body or authority having jurisdiction thereover. In case of dispute between Owner and Licensee as to whether or not Licensee's attachments comply with such codes and regulations, Owner shall be the sole judge. Owner shall be the sole judge as to the

requirements for the present and/or future use of its attachments and equipment and of any interference therewith.

2. Where it is necessary for Owner to install a new pole for joint use hereunder, such new pole being taller or stronger than considered by Owner to be adequate to accommodate the attachments of Owner and its other licensees to be placed on the new pole, Licensee covenants and agrees to pay to Owner a sum equal to the difference between the cost in place of such new pole and the current cost in place of a pole considered by Owner to be adequate to accommodate the attachments of Owner and its other licensees, under the following conditions:

    a. Where the new pole is installed to establish joint use hereunder and the extra height or strength is necessary solely to adequately accommodate the attachments of Licensee in accordance with the codes and/or regulations referred to in Paragraph 1 hereof.

    b. Where the new pole is installed to replace an existing jointly used pole hereunder and the extra height or strength of the new pole over that of the old pole is provided to adequately accommodate the attachments of Licensee in conformance with the codes and/or regulations referred to in Paragraph 1 hereof.

    c. Where a new pole is installed to replace an existing jointly used pole hereunder and the replacement is made to adequately accommodate additional attachments of both Licensee and Owner or its other licensees in accordance with the codes and/or regulations referred to in Paragraph 1 hereof.

    d. Where a new pole of the same size as the existing pole is installed to replace an existing pole jointly used hereunder on account of damage or decay, and the old pole was taller or stronger than considered by Owner to be adequate to accommodate the existing attachments of Owner and its other licensees for the purposes of adequate accommodating the existing attachments of Licensee in accordance with the codes and/or regulations referred to in Paragraph 1 hereof. However, the Licensee shall in no event pay more than the amount required to replace said facility with like kind.

3. In the event a new pole is needed to accommodate the Licensee's attachments, said poles shall become the property of the Owner and the Licensee shall acquire no right except the use of the same subject to the conditions set forth herein.

4. Where a new pole is erected hereunder to replace an existing pole solely to adequately provide for the attachments Licensee proposes to place on the new pole, Licensee covenants and agrees to pay Owner, in addition to the amount called for in Paragraph 2 hereof, a sum equal to the then value in place of the pole which is replaced subject to credit for expended life, plus the cost of its removal, minus the salvage value of the removed pole. Licensee shall also pay to the respective owners thereof the cost of removing all existing attachments from the existing pole and reestablishing the same attachments on the newly installed pole.

5. Licensee hereby releases Owner from any and all liability for loss of or damage to such attachments of Licensee and for any interruption to or failure of any service in which such attachments are used. Any action against the Licensee for injury to any person, including death or damage to or destruction to any property, including loss of use thereof, arising out of Licensee's use of Owner's poles, shall be brought against the Licensee through the Board of Claims, pursuant to KRS 44.010 through KRS 44.990. Nothing in this paragraph is to be construed as relieving the owner of liability through any act of negligence.

6. Owner reserves the right to discontinue the use of, remove, replace or change the location of any or all of its poles or attachments thereon regardless of any occupancy of Owner's poles by Licensee and Licensee shall at its sole cost, upon thirty (30) days written notice by Owner, make such changes in or removal of its attachments as shall be required by any such action of Owner as aforesaid and Owner shall not be obligated to furnish or substitute other poles, facilities or accommodations in the place of those vacated by Licensee.

7. Whenever in the judgement of Owner, Licensee's attachments shall interfere with the operation of the equipment of Owner or constitute a hazard to the service rendered by Owner and upon thirty (30) days written notice to Licensee of such interference or hazard, Licensee shall either immediately rearrange, change or remove its attachments as Owner may direct. In case of emergency, Owner reserves the right to remove, rearrange or disconnect the attachments of Licensee without notice and no liability to any person therefor shall be incurred by such action.

8. Owner shall not be required to secure any right, license or permit from any governmental body or authority or other person or persons which may be required for the construction and/or use and maintenance of said attachments of Licensee and Owner does not guarantee any easements, rights-of-way or franchises for the construction and/or use and maintenance of such attachments.

9. If Licensee should desire to add to the number of its authorized attachments or relocate an existing attachment, it shall make application therefor by submitting a revised Pole Attachment Permit to Owner and if said revised Permit is granted by Owner, it shall supersede all permits issued prior thereto and shall be considered a part of this agreement.

10. This agreement shall continue in force and effect for a period of one year from and after the date hereof and thereafter until terminated by either party by giving to the other written notice at least ninety (90) days in advance of the termination date therein specified. Upon termination of this agreement as herein provided, Licensee shall remove its attachments from the poles of Owner without undue delay and complete such removal prior to the specified termination date.

11. This agreement cancels and supersedes any previous joint use agreement, Licensee or joint use affecting Owner's poles and Licensee's attachments covered hereby and shall be binding upon and inure to the benefits of the parties hereto, their respective successors and/or assigns.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be executed as of the day and year first above written.

KENTUCKY POWER COMPANY

By:_____
Vice President

TRANSPORTATION CABINET
Department of Highways

By:_____
Secretary of Transportation

Approved, form and legality

Assistant Attorney General

POLE ATTACHMENT PERMIT

NO._____

DATE_____

Supersedes Permit No._____DATE_____

The undersigned licensee (Licensee) hereby applies to below named power company (Owner) for the use of Owner's poles described below, for a license and permission to place and/or maintain attachments described in the following table on the poles of Owner therein described.

TABLE DESCRIBING ATTACHMENTS AND POLES COVERED BY THIS PERMIT

Pole Number	Height and Class	Location	Number and Kind of Attachment

Said attachments are to be placed and/or maintained on the said poles in the manner and under the conditions set forth in the attached agreement, dated_____, between Licensee and Owner.

TRANSPORTATION CABINET
STATE OF KENTUCKY (Licensee)

By_____

Owner does hereby grant the License and permission above applied for upon the terms and conditions specified in said agreement.

KENTUCKY POWER COMPANY (Owner)

By_____

ITEMS FOR INSTALL

EXHIBIT 18

Cabinets	
T-01-0010	Pole Mounted 336 Cabinet
T-01-0020	Base Mounted 332 Cabinet
T-01-0100	170 Controller
T-01-0510	Isolator, Model 242 (for ped detector)
T-01-0520	Isolator, Model 252 (for Railroad)
T-01-0600	Loop Detector, Model 222
T-01-0700	Load Switches

Special items	
T-02-0099	Audible ped. Signal
T-02-0400	Video Detection
T-02-0500	Radios
T-02-0510	Antenna 3 db omni
T-02-0520	Antenna 6 db yagi
T-02-0530	Antenna 9 db omni
T-03-0230	Jumper 3' N-N RG-58
T-03-0240	Jumper 60' N-N RG-213
	Master Cable
	Remote Cable
T-06-0800	Surge Protector
	Power Source
	Master Controller

Poles	
T-04-0000	Steel Strain Pole 26 foot
T-04-0010	Steel Strain Pole 28 foot
T-04-0020	Steel Strain Pole 30 foot
T-04-0030	Steel Strain Pole 32 foot

Roundabout Justification Study
~~Exhibit 18~~

District:	
County:	
City:	
Main Street:	
Milepoint:	
Side Street:	
Prepared By:	
Date:	

Kentucky Transportation Cabinet

EXHIBIT 19

Primary Justification Category	
☐ Safety Improvement	☐ Low Volume Signal Alternative
☐ AWSC/TWSC Alternative	☐ Medium Volume Signal Alternative

Secondary Justification		
☐Traffic Calming	☐Community Enhancement	☐Other:

Existing Traffic Control	
☐ Two-way Stop Control (TWSC)	☐ All-way Stop Control (AWSC)
☐ Traffic Signal	☐ Not Applicable

Traffic Data Used in Analysis		
%Trucks =	☐ Peak Hour Volume	Year -
Growth Rate = %	☐ 15 Minute Peak	Year -

Approach Volumes					
Direction	Street Name	Total Approach Volume	Number of Left-Turning Vehicles	Number of Through Vehicles	Number of Right-Turning Vehicles
1. NB					
2. SB					
3. EB					
4. WB					
5.					

Satisfying of Warrants			
☐AWSC	Signal Warrant #1:	☐ Condition A	☐ Condition B

Crash History				
☐Applicable	Total Crashes:	in	months	# Fatal:
☐Not applicable				# Injury:
				# Property Damage:

Benefit/Cost Information		
☐Applicable	Preliminary Cost Estimate =	B/C Ratio =
☐Not applicable	Estimated Benefits =	

LOS Calculations			
Roundabout:	Signal:	AWSC:	TWSC:

Attachments	
☐ 24-hour approach counts	☐ Geometric layout of roundabout
☐ Pk. hr. turning movement counts (15 min. int.)	☐ Pedestrian/bicycle counts
☐ Plan sheet or layout of existing intersection	☐ Signal warrant analysis
☐ Collision diagram or crash summary	☐ AWSC warrant analysis
☐ Crash reports	☐ Other:

Analysis of Site Conditions

1. Are there any high traffic generators that could cause operational problems?
2. Are there nearby preempted signals or highway-rail crossings that could negatively impact a roundabout?
3. Are there any other bottlenecks in the area that could back up traffic into the roundabout?
4. Are there any sight distance obstructions?
5. Is platooned arterial traffic flow likely on one or more approaches (i.e. from signal system coordination)?
6. Does the topography support a roundabout (bottom of vertical curve, flat approach grades, etc.)?
7. Can the roundabout be constructed on a plateau (grades through intersection less than or equal to 3%)?
8. Can physical and ROW features at this location accommodate an acceptable design and diameter?
9. Is there any public transit usage (routes, stops, etc.) that could affect the operation of a roundabout?
10. Is there any local opposition or support for the installation of a roundabout? Other community comments?
11. Is this intersection located in an area of high pedestrian or bicycle activity?
12. Is there likely to be a high number of pedestrians with special needs at this intersection?
13. Does the radial alignment of the approaches support the installation of a roundabout?
14. Are there any issues involving the operation of emergency vehicles in the area?
15. Is intersection located at the edge of town? If so, will roundabout reinforce the change in environment?
16. Is an electrical source readily available should lighting be necessary at the roundabout?
17. Are there any issues concerning traffic control during construction of a roundabout?
18. What is anticipated design vehicle (including length) for the roundabout?
19. Are the mainline and side street volumes relatively balanced? What is the ratio of the two volumes?
20. Are there any other problems that have been identified?
21. Are there any other physical/geometric features that would complicate the roundabout alternative?

Operational Analysis
If a roundabout is being considered as an alternative to a traffic signal, describe the signal operating plan used in the comparison, including number of lanes, lane use, left-turn protection, signal phasing, timing plan, etc.
Plan:

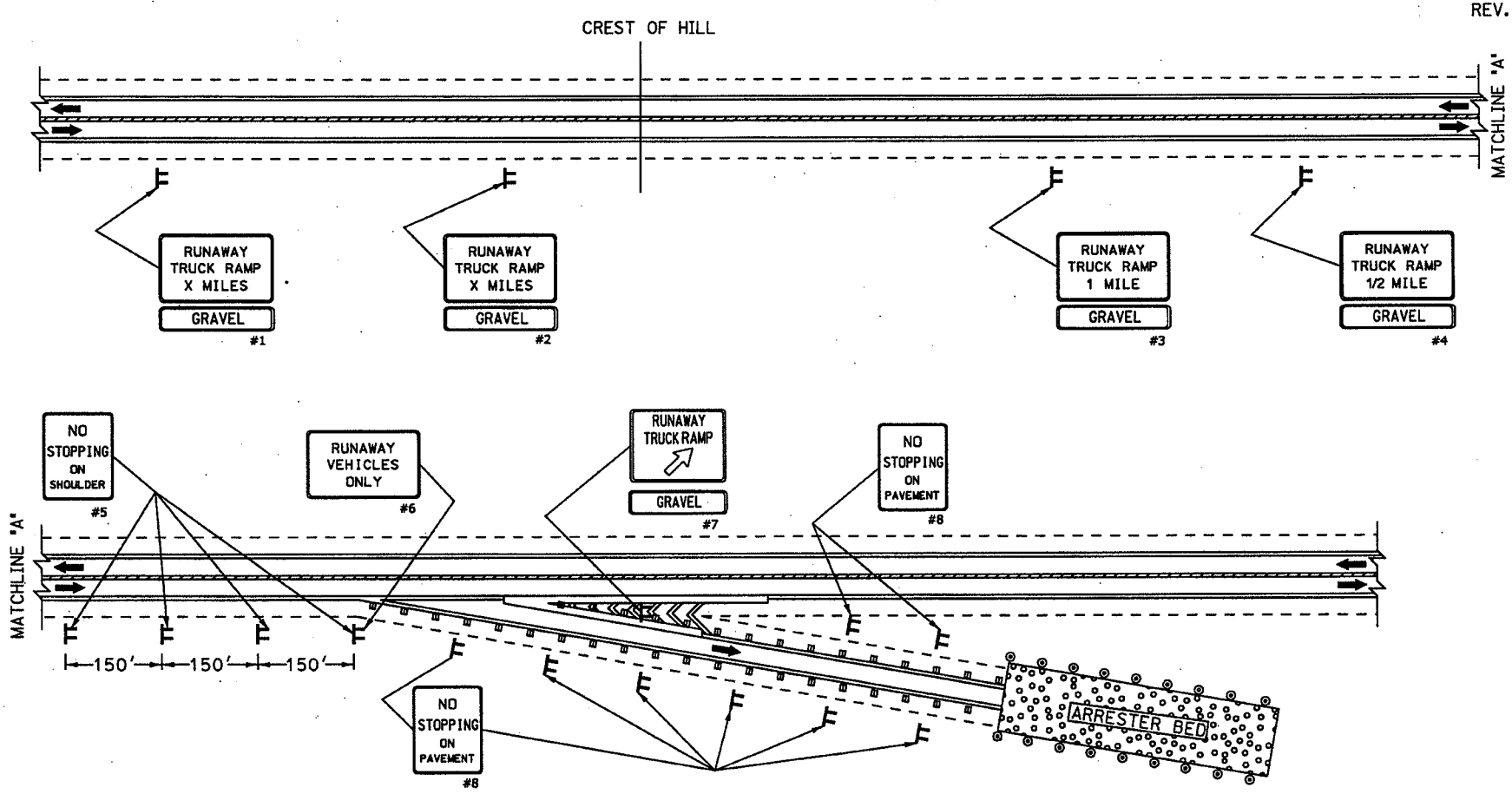
Performance Comparison				
Performance Measure	Roundabout	Traffic Signal	AWSC	TWSC
Critical v/c				
Delay per Vehicle Overall Critical Movement				
LOS Overall Critical Movement				
Projected Queue Lengths (feet)				

* An "X" indicates that delay was not computed because one or more movements were oversaturated.

Note: In most cases, roundabouts should not be approved if they will operate at more than 85% capacity.

Final Recommendation:

REV. 06/05



GENERAL NOTES:

1. SIGN ASSEMBLIES #1 AND #2 SHOULD BE INSTALLED APPROXIMATELY 1 MILE AND 1/2 MILE IN ADVANCE OF HILL CREST.
2. SIGN ASSEMBLIES #3 AND #4 SHALL BE INSTALLED APPROXIMATELY 1 MILE AND 1/2 MILE IN ADVANCE OF THE RAMP ENTRANCE.
3. SIGNS #5 SHALL BE INSTALLED IN ADVANCE OF THE RAMP ENTRANCE TO PREVENT THE OBSTRUCTION OF THE SIGNING AND LOCATION OF THE RAMP ENTRANCE.
4. SIGN #6 SHALL BE INSTALLED NEAR THE RAMP ENTRANCE TO DISCOURAGE OTHER ROAD USERS FROM ENTERING.
5. SIGN #7 SHALL BE INSTALLED AT THE RAMP GORE.
6. SIGNS #8 SHALL BE INSTALLED AT A SPACING OF 150 FEET ALONG BOTH EDGES OF THE RAMP BETWEEN THE RAMP ENTRANCE AND THE ARRESTER BED.
7. A SUPPLEMENTAL PLAQUE WHICH DESCRIBES THE RAMP SURFACE SHOULD BE INSTALLED ON SIGN ASSEMBLIES #1 THRU #4 AND #7.
8. BOTH SIDES OF RAMP APPROACH SHALL BE DELINEATED WITH MONO-DIRECTIONAL (RED) PAVEMENT MARKERS OR RED FLEXIBLE DELINEATORS. SPACING SHALL BE 50 FEET.
9. BOTH SIDES OF ARRESTER BED SHALL BE OUTLINED WITH RED FLEXIBLE DELINEATORS AT A SPACING OF 50 FT.

LEGEND

- DELINEATOR (RED)
- SIGN
- DIRECTION OF TRAVEL
- PAVEMENT MARKER (MONO-RED)

PAVEMENT MARKINGS

- YELLOW
- WHITE

DRAWING NOT TO SCALE

EXHIBIT 20
RUNAWAY TRUCK RAMP SIGNING AND MARKINGS

BICYCLE/SHARE THE ROAD WARNING SIGN REQUEST FORM

Bicycle warning signs (W11-1) and Share the Road supplemental plaques (W16-1) may be installed by the Kentucky Transportation Cabinet where there is a need to warn motorists to watch for bicyclists traveling along the highway. Excessive use of this sign combination should be avoided as proliferation of signs tends to diminish their effectiveness. Requests for such signs should normally come from a municipality or other responsible party (such as a recognized bicycle advisory board or committee).

TO BE FILLED IN/PROVIDED BY REQUESTING AGENCY/PARTY

Requesting Agency/Party: _____

Contact Name: _____

Contact Phone Number: _____

County: _____

Route: _____

Please include the following attachments:

- Documentation of a significant bicycling demand for the route
- Identification of sections of roadway where signs are desired

For Department Use

Is highway on a federally, state, or locally designated bike route? _____

Are there areas where there are significant changes in roadway character (such as narrow shoulders, noncontinuous bike lanes, and/or obstructions) that necessitate co-use of the traveled way? _____

Average Daily Traffic: _____

Shoulder Width: _____

Crash History Involving Bicycles:

Date Range From: _____ To: _____

Collisions: _____

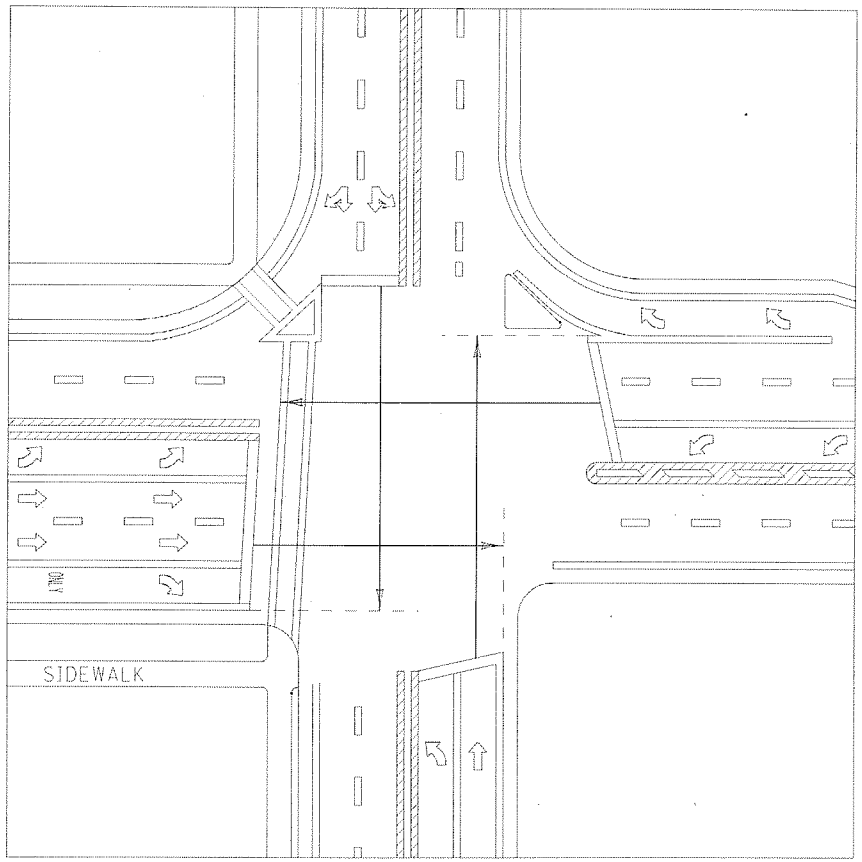
Fatalities: _____

Injuries: _____

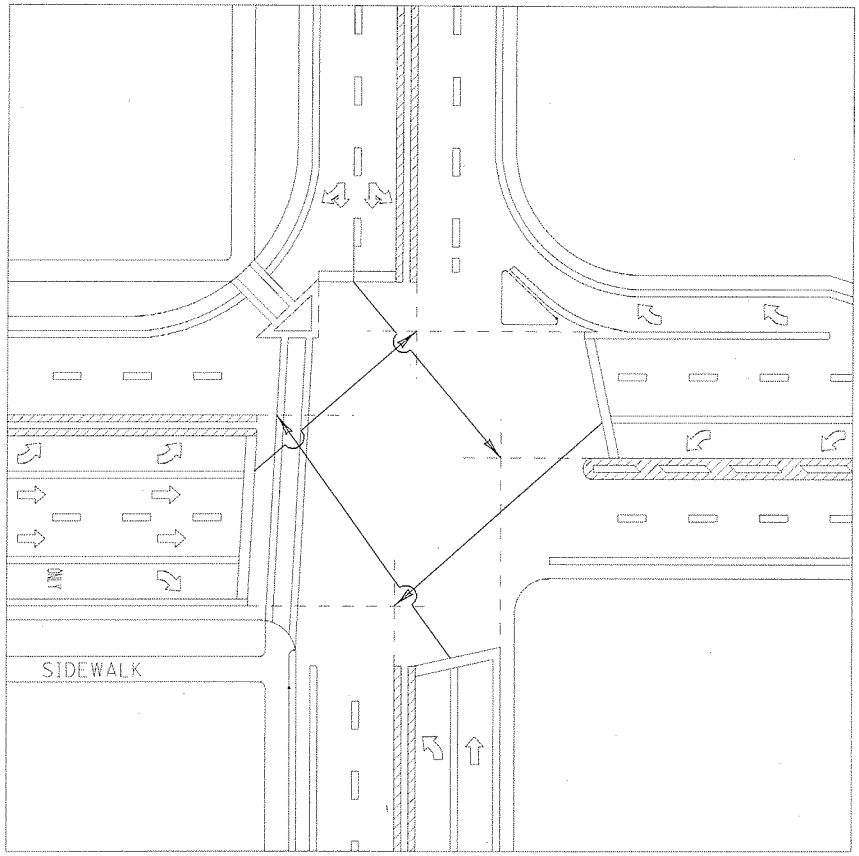
Submit Form To:

Bicycle and Pedestrian Coordinator
Kentucky Transportation Cabinet
Office of Special Programs
Department of Governmental Relations
200 Mero Street
Frankfort, KY 40622

REV. JULY, 2008



MEASUREMENT OF CLEARANCE DISTANCES FOR
THROUGH MOVEMENTS



MEASUREMENT OF CLEARANCE DISTANCES
FOR LEFT-TURN MOVEMENTS

1. ROUND MEASUREMENTS UP TO NEAREST 5'.
2. CLEARANCE DISTANCES FOR LEFT-TURN MOVEMENTS SHOULD BE MEASURED ALONG A STRAIGHT LINE FROM THE RIGHT EDGE OF THE LEFT-TURN LANE TO THE INTERSECTING POINT OF THE FAR EDGE OF THE TWO CONFLICTING TRAFFIC STREAMS.
3. WHEN RIGHT-TURN LANES ARE PRESENT, MEASURE TO FAR SIDE OF RIGHT-TURN LANE.
4. WHEN CROSSWALKS ARE PRESENT, MEASURE TO FAR SIDE OF CROSSWALK.
5. LANES UNDER YIELD CONTROL SHOULD NOT BE TAKEN INTO ACCOUNT WHEN MEASURING CLEARANCE DISTANCES.

EXHIBIT 22
MEASUREMENT
OF CLEARANCE
DISTANCES

YELLOW CLEARANCE INTERVALS

Speed (MPH)	Grade of Approach								
	Uphill				*Level*	*Downhill*			
	+4%	+3%	+2%	+1%	0%	-1%	-2%	-3%	-4%
20	2.3	2.4	2.4	2.5	2.5	2.6	2.6	2.7	2.7
25	2.7	2.7	2.8	2.8	2.9	2.9	3.0	3.1	3.2
30	3.0	3.1	3.1	3.2	3.2	3.3	3.4	3.5	3.6
35	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	4.0
40	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4
45	4.0	4.1	4.2	4.2	4.3	4.5	4.6	4.7	4.8
50	4.3	4.4	4.5	4.6	4.7	4.8	5.0	5.1	5.3
55	4.6	4.7	4.8	5.0	5.1	5.2	5.4	5.5	5.7

Calculated yellow clearance is less than 3.5 seconds or greater than 5.0 seconds.

RED CLEARANCE INTERVALS

Speed (MPH)	Clearance Distance (Feet)										
	20	30	40	50	60	70	80	90	100	110	120
20	0.7	1.1	1.4	1.8	2.1	2.4	2.8	3.1	3.5	3.8	4.1
25	0.6	0.9	1.1	1.4	1.7	2.0	2.2	2.5	2.8	3.0	3.3
30	0.5	0.7	1.0	1.2	1.4	1.6	1.9	2.1	2.3	2.5	2.8
35	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
40	0.4	0.6	0.7	0.9	1.1	1.2	1.4	1.6	1.8	1.9	2.1
45	0.4	0.5	0.7	0.8	1.0	1.1	1.3	1.4	1.6	1.7	1.9
50	0.3	0.5	0.6	0.7	0.9	1.0	1.1	1.3	1.4	1.5	1.7
55	0.3	0.4	0.5	0.7	0.8	0.9	1.0	1.2	1.3	1.4	1.5

Calculated red clearance is less than 1.0 second or greater than 3.0 seconds.